the OIL AND GAS JOURNAL

DECEMBER 9, 1957

★★★ EXPLORATION HIGHLIGHTS P. 189

Drilling Crews Again Target of Labor

This time it's a more potent threat.

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California Bids High for Four Corners Crude

. . . and it puts Gulf Coast buyers on the spot

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★ HOW TO

Control Catalyst Erosion

IN CAT CRACKERS p. 101

CASE HISTORIES TELL HOW REFINERS SOLVE TOUGH MAINTENANCE PROBLEMS

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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Dec. 9, 1957

Labor is reviving its drive to organize drilling crews:

This time union strategy is different, more effective. Use of threats and picketing have been abandoned after last summer's defeat in the Permian basin. Organizers now are using the federal labor machinery (p. 63).

Here's the strategy: Sign up at least 30 per cent of a drilling contractor's employes. Then petition NLRB for a vote whether union should serve as their bargaining agent. If 51 per cent of workers approve, the union is in. If the contractor refuses to bargain or fires union members, he is fair game for unfair labor practices suit.

Permian basin again is scene of union drive. First elections come up this week. Others will follow. Contractors fear the union strategy will work.

If union wins, their demands then will be: Shorter work week with same pay, transportation to and from rig, paid vacations, larger crews, and safer rigs. Most contractors say they will be committing economic suicide if they meet such demands.

Tipoff on OCAW 1958 wage goals for oil industry may be seen in Canada.

Union there is planning to demand wage boost of 8 per cent with a minimum raise of 18 cents an hour.

Other goals: Premium pay of 30 cents an hour above regular wage for Sunday work, double time for overtime, shift differential raises of 8 and 16 cents, and 3-week vacation after 8 years of service.

OCAW meanwhile has settled its strike at Imperial's refinery near Vancouver. After 9 weeks off, members got raises of 11 to 22 cents an hour, $144 lump sum retroactive pay. Contract runs until next August 31.

West Coast buyers have inside track for Four Corners crude.

Two majors have posted $3.15 bbl. price there. This puts a crimp in plans of Gulf and Mid-Continent buyers who will have to add heavier pipeline charges before any oil they buy in Four Corners reaches their refineries.

Big question asked by pipeliners now: Will the new Texas-New Mexico line get any Four Corners business? (p. 66).

Foreign steel is eying the U. S. oil-country market. Italian casing and tubing were offered last month at $10 under the Pittsburgh-plus-barge price to Houston.

Two barges also appeared on the Gulf with materials from a new Canadian producer at $2 per ton under U. S. price. Japanese reportedly are planning to enter the U. S. oil-country market in an attempt to recoup loss of their Canadian outlets.

The trend, if it grows, is bound to complicate an already soft domestic market for oil-country goods.

Foreign price cutting is a reversal of the situation only a few months ago. Then some U. S. users were willing to pay a premium for foreign goods. But slackened drilling activity plus effect of beefed-up American and foreign steel-making capacity has put the pressure on prices.

The prospect of foreign steel flooding the U. S. market has prompted at least one eastern congressman to make this proposal: Impose a quota on imports of oil-country steel goods.

There's disturbing long-range weather news for the Gulf Coast.

Offshore operators might keep this report from the Weather Bureau in mind: Fewer hurricanes are likely the next few years. But a pressure area apparently tied to hurricane formation has shifted. It may mean that the blows which do come will hit the gulf states instead of the Atlantic Coast.

Analysts now have tallied oil profits for first 9 months: Net income of 46 companies increased 12.3 per cent over same period last year—from $2.5 billion to $2.8 billion. Most of the increase came in first half when oil profits were 19 per cent higher.

For 9-month period, 13 companies reported lower earnings than last year. And 25 reported reduced third-quarter earnings.

Carl H. Pforzheimer & Co. made this analysis of the reports: Poorest showings, generally, were made by integrated domestic companies heavily engaged in refining. Better returns were shown by companies engaged essentially in production. They profited more from comparatively higher average crude prices.

Expect a decision by midmonth on imports controls for the West Coast.

Imports Boss Carson says he will make his recommendation to cabinet committee by next week. He is giving no inkling of his thinking on the subject. But there's a feeling in Washington domestic producers on the West Coast may get some measure of relief matching that granted in the rest of the country.

Alberta's oil producers are feeling a real pinch.
They are finding oil markets dwindling in Ontario, the U. S. Great Lakes region, and on the Pacific Coast. Alberta production in December, as a result, will drop 33 per cent below the record 447,896 bbl. daily run for the same month last year.

What's the reason? Slashed tanker rates are making foreign crude cheaper on the West Coast. Nonprorated Saskatchewan oil is taking over some of the Alberta markets. Oil consumption is rising at a lower than expected rate.

The production slump already has depressed drilling in the province. It will show up later in decreased profits to U. S. firms with heavy investments there.

Alaska stands to be the next really "hot oil area."
Magnitude of Richfield's Swanson River discovery is just now coming to light. The closed structure revealed by the strike is unofficially reported to cover nearly 100,000 acres. Thus the prospective field exceeds the 71,680-acre lease held jointly by Richfield and California Standard.

Some geologists think Richfield-Socal may be playing with a billion-barrel field. Socal already has earmarked $30 million as its share of future development costs.

One expert familiar with Alaska now predicts at least a dozen more major fields will be found in Alaska within the next decade (p. 191).

Drilling management now has a uniform cost system—long a bugaboo of the industry.
The new AAODC Accounting Manual goes a long way toward making drilling contractors one of the best-informed managements in business. It is based on one idea: Time is the most practical unit of production cost in drilling. The task then is to find the cost per rig contract day for operating a given rig.

One dividend: The costing charts are flexible enough to give control over the smallest unit of cost and enable the contractor to pursue an intelligent economy program (p. 104).

A cure for gas channeling from injection to producing well in repressuring projects has been found.
Engineers faced the problem in the Fullerton Clearfork Unit in West Texas. Gas reached the producing wells faster in one stratum than in others. Gas-oil ratios jumped and oil production sagged.

Trouble was cured with open-hole packers. Same idea could be used elsewhere in gas-injection projects and where a gas cap is open to the well bore (p. 111).

That Williston basin-Great Lakes crude line has hit a snag. Basin producers are unwilling to take a wellhead price out to move their shut-in crude.

Great Northern Railway is considering the 400 to 600-mile, 12-in. line with capacity of 20,000 bbl. daily. It would run from northwest North Dakota or northeast Montana to Duluth and Superior, Wis.

Tip on trouble was voiced by North Dakota Governor Davis last week. He said market for state's shut-in oil hinges on producers taking a cut of 10 per cent or more in the posted price to make the oil competitive with Canadian crude.

Uncertainty over Canada's gas-export policy may play hob with several big pipeline projects.

Word from Washington is that the FPC may reopen the whole question of approving pipeline projects based on Canadian gas.

A delay now may result in decision on Midwest Gas Transmission case which has precipitated a major battle for Midwest gas markets. Other projects face delays until Canada clears up its policy: Westcoast Transmission's big-inch line from Savanna Creek to the U. S., and Alberta & Southern's line from Peace River to San Francisco.

Practical tests of competing pipe-protection materials are being furnished on Natural Gas Pipeline's 350-mile line from Bridgeport to Fritch, Texas.

Asphalt, coal tar, and plastic tape all are being used. Idea is to test effectiveness of different materials and determine their relative costs.

Pipeline observers say the project reflects a current trend in pipeline management to evaluate new techniques more than ever before (p. 98).

First digital computer for controlling a refining process automatically will make its bow next year.

Texaco plans a new control system on a poly unit at its Port Arthur, Tex., refinery. The system combines features of a computer and data logger and can be tied into process controls.

Cost will be upwards of $150,000. Chief payoff will be in valuable know-how and information to be gained for further expansion of automation. Refinery men still believe the push-button refinery is still down the road (pps. 72-74).

Two important petrochemical plants are on stream.

World's largest polypropylene plant has started up at Parlin, N. J. Hercules Powder has put an introductory price of 65 cents per pound on its product, called the most significant new plastic to be developed in years. Price is expected to come down when large-scale production is reached.

W. R. Grace's new polyethylene plant at Baton Rouge, La., has successfully completed 2 weeks of shakedown operation. Delivery of product will start soon. Grace is trucking its raw ethylene from East Texas until Esso completes its nearby plant.

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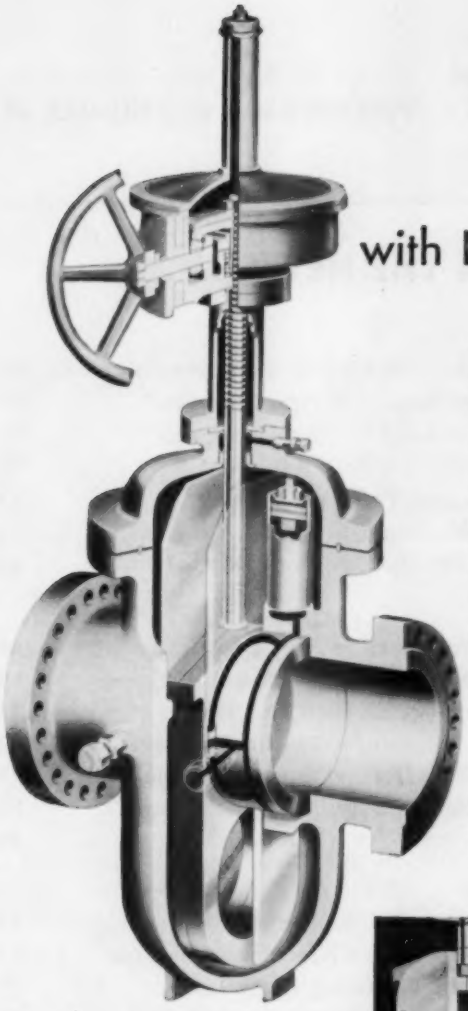

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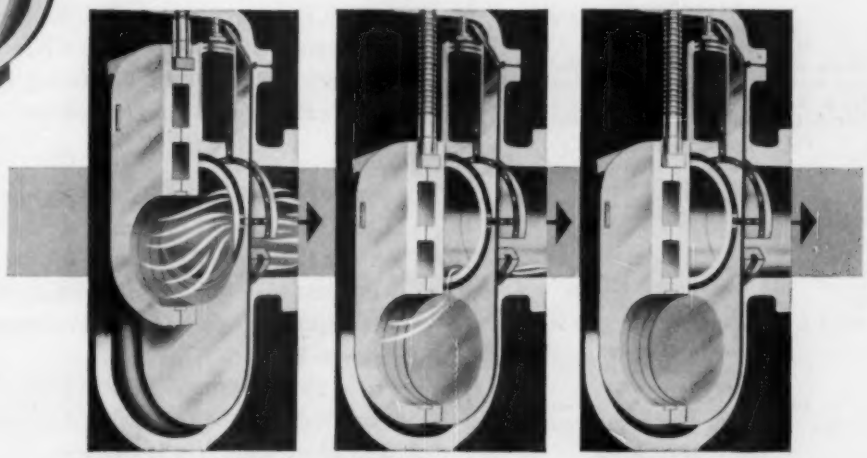
Above: *Cutaway showing heavy, self-aligning gate and parallel seat assembly, with one of the two sealing systems indicated.*

Right: *Diagrams of closure action on downstream side of gate.*



APPROACHING CLOSURE... *No loss of sealant as sealing groove in seat is disconnected from reservoir until gate is fully closed.*

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Phone LOngacre 4-6160
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HOUSTON OFFICE
802 Sterling Building
Phone CApitol 4-7726
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DALLAS OFFICE
1238 Mercantile Bank Building
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Phone VAndike 0722
D. H. Stormont ..... District Editor
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WASHINGTON OFFICE
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Phone District 7-1710
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TECHNOLOGY—OPERATION

Pipelining

Natural Gas Pipeline Co. Uses Three Kinds of Pipe Protection **98**

By Paul Reed

The company, in line with its policy of testing materials and methods of merit, is using coal tar, asphalt, and plastic tape on different sections of its 350-mile main line from Bridgeport, Tex., to Fritch, Tex.

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By D. H. Stormont

This liner, designed to provide maximum resistance to collapse, may prove a valuable aid where sand control is a problem. Its design also makes for less perforation plugging.

New Cost Guide for Drillers **104**

By W. K. Powell

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By Ed McGhee

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By Larry Resen

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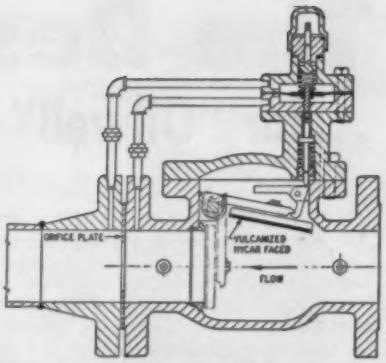

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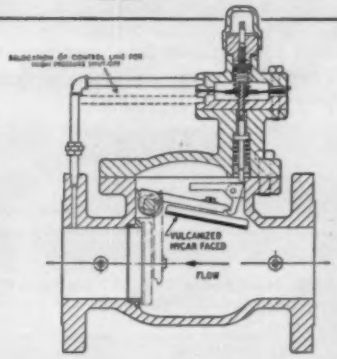

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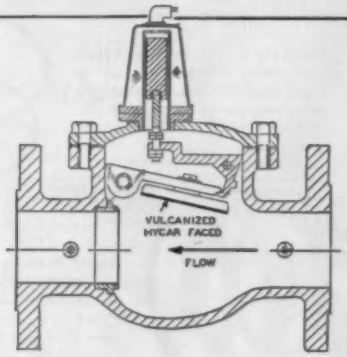

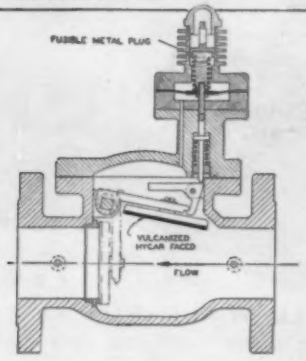

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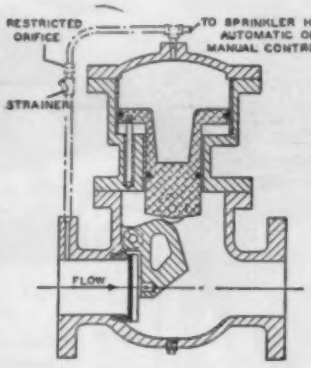

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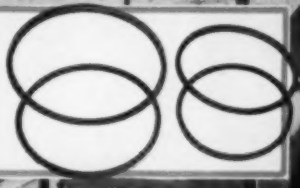

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Outlook—First Step in Williston's Comeback
By John C. McCaslin
TEMPERATURE BARRIER BROKEN by Ginther, Warren & Ginther KILLAM WILDCAT at Pescadito Salt Dome
Huge Salt Dome Found
Wildcat confirms Pescadito structure near Laredo as big dome. It extends great Southwest Texas salt basin 35 miles west and opens up exciting oil possibilities
LAREDO.—A deep wildcat which so far hasn't found any oil has turned up the most exciting geological information in Texas this year. It proved Webb County's long-recognized Pescadito structure
PESCADITO SALT DOME
HOUSTONIANS' TEST IN WEBB SETS RECORD
Ginther, Warren & Ginther of Houston
Pescadito test looks good as . . .
Huge Salt Dome Yields Gas
LAREDO. — South Texas' biggest exploration news—the Pescadito dome—is getting hotter.
Ginther, Warren & Ginther's wildcat on the structure had a big gas flow on a test last week. The well made headlines 2 weeks ago when it proved the existence of the deep salt dome (OGJ, June 24, p. 105).
Indicated producing horizon is the Georgetown lime. The test lasted only 20 minutes before a joint of drill pipe collapsed. During that 20 minutes, the well flowed gas with a tubinghead pressure of 2,400 psi. against a ¾-in. choke. There was no measure of the volume nor of the fluids content.
The hole will be resumed just as soon as the operator can condition the mud, get the pipe out, and get
were their cases. For that reason, Ginther, Warren & Ginther took average of the two readings—450° F.—as correct temperature at log depth of 14,552 ft.
The company had expected to drill as deep as 17,000 ft. to find the main objective, the Edwards. Previous wells on the Pescadito structure logged high temperature gradients and it appeared that bottom-hole temperature of the 1 Killam might reach 500° F. if it found the Edwards. Previously, Magnolia Petroleum Co. chalked up the highest temperature ever drilled—in West Ranch, Texas, field in 1955. There temperature reached 389° F.
Lime-treated muds common to South Texas drilling

Ginther, Warren & Ginther's confirmation of the deep Pescadito salt dome at Laredo is the most exciting geological performance in Texas this year.

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Low-sodium DMS surfactant mud gave trouble-free performance, despite a record bottomhole temperature of 460°F at 14,552 feet. This is even more remarkable since the mud was subjected to numerous gas kicks and contaminated by drilling more than 700 feet of solid salt in the bottom of the hole.

COST: Contrary to expectations, the low-sodium DMS surfactant mud used costs no more than an ordinary mud of equivalent weight.

SERVICE: Magcobar programmed and serviced this low-sodium DMS mud designed for high-temperature drilling. Magcobar is prepared to assist in planning trouble-free DMS surfactant muds for the deeper, hotter holes which will open new producing horizons.

Contact Magcobar, using this coupon, for the complete information bulletin on DMS surfactant muds.

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MAGCOBAR
P.O. Box 6504, Houston 5, Texas

Please send me your DMS surfactant muds Bulletin.

Name..... Title.....

Company.....

Address.....

City..... State.....

WIRE ROPE AT WORK

Crews of the Rutledge Drilling Company make hole fast. Here's a typically busy Rutledge outfit, snapped by the photographer in northwest North Dakota. The men were letting no grass grow under their feet, as the log-book proved. In three days' time, they had sunk the hole to 5000 ft through tricky sand and shale. They expected to go an additional 3600 before completing the well.

On their previous job they had gone to 8417 ft in record time for that particular field. In the drilling of both wells, Bethlehem rotary line was used—the same sturdy rope you see in the picture. Rutledge rigs are equipped regularly with Bethlehem wire rope, for this tough, long-lasting product is always dependable, always a top-flight performer.

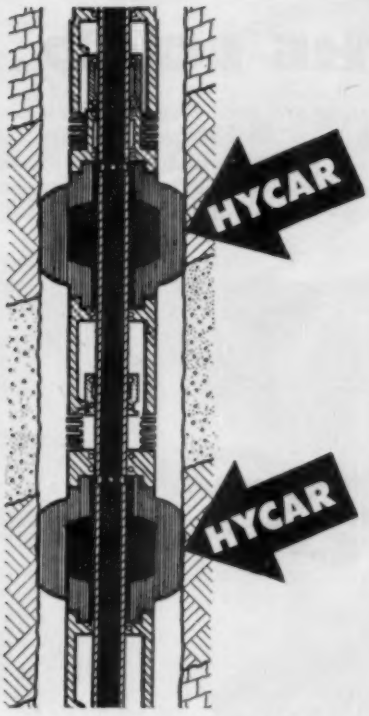
Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

PETROLEUM • CONSTRUCTION • EXCAVATING • MINING • QUARRYING • LOGGING • MANUFACTURING

Another new development using

B.F.Goodrich Chemical *raw materials*



Straddle Treating and Testing Tool is manufactured by Lynes, Inc., Houston, Texas. Hycar nitrile rubber is supplied by B.F.Goodrich Chemical Company.

INFLATABLE HYCAR ELEMENTS QUICKLY SEAL OR RELEASE STRADDLE PACKER

THIS straddle packer isolates portions of the well bore for selective treating or testing. Two inflatable elements of Hycar nitrile rubber, separated by a steel housing, provide positive seal against high differential pressures and give the packer nonslip anchoring.

Because they are made of Hycar, these elements can be inflated with acid, oil or water—killers of ordinary rubber. They stay flexible, strong, expandable; hold size and shape; withstand hydrocarbons and drilling mud chemicals. In addition, they conform when inflated to irregular shaped holes, to provide excellent sealing. To release the packer, the elements can be quickly deflated.

Resistance to wear, salt water, impact, vibration, high pressures and temperature extremes make Hycar an outstanding material for a broad variety of oil and gas field products. Seals, liners, valve seats and cylinders are typical examples.

For technical information on Hycar, write Dept. HB-7, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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Reg. U.S. Pat. Off.
American Rubber

B.F.Goodrich Chemical Company
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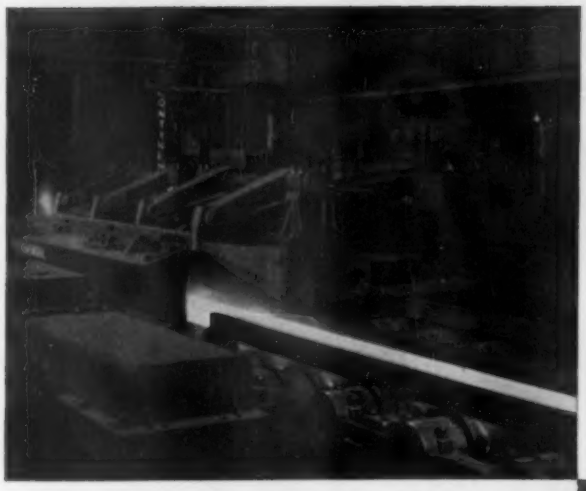
B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors



THE HEAVIER THE LOAD...

the more you need HYATTS . . . because for sheer load-carrying capacity in continuous service, straight cylindrical roller bearings have no equal. That's why leading steel mills use HYATT Hy-Rolls for dependability.

THE HIGHER THE SPEED...

the more you need HYATTS . . . because they're built with superior steels, scrupulous control of internal clearances and uncompromising inspections to assure smoother running, even at RPM's required in jet engines.

THE MORE YOU NEED *Cylindrical* HY-ROLL BEARINGS

More and more, as loads and speeds edge upward and housings must often be reduced in size, design engineers are turning to HYATTS to help squeeze improved life/load ratings into limited space. Quality-built HYATT Hy-Rolls not only solve the problem of increased radial loads, but the shouldered-race types will take a surprising amount of thrust as well. Ask your nearest HYATT Sales Engineer for recommendations—he can be a mighty big help to you! Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.; Pittsburgh; Detroit; Chicago; and Oakland, California.

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GM FORWARD FROM FIFTY

HYATT HY-ROLL BEARINGS

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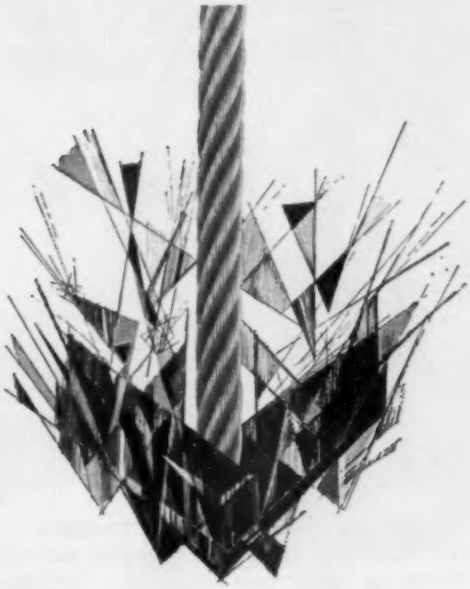
Stands up to **bending fatigue**

Absorbs **shock** and **impact**

Has **higher strength**



Withstands **Abrasion**

These four qualities in Roebling Royal Blue Wire Rope mean **longer service life!**

They all add up to the fact that Roebling Royal Blue will deliver more work on your job—regardless of what it is. It's as simple and money-saving as that. For full information on Royal Blue, the rope that's stronger than yesterday's strongest, talk to your Roebling Distributor or write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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Subsidiary of The Colorado Fuel and Iron Corporation

Sam D. Rogers, President, Rogers Geophysical Company, is shown here with Abbie and Durka, the two six-months-old Hippos captured in the area where Rogers' crews are working in Somaliland and presented by Mr. Rogers to the Houston, Texas, Hermann Park Zoo.

The names, Abbie and Durka were given to the Hippos by members of Rogers Geophysical crews prior to the Hippos' departure, via air freight, from Somaliland.

HOW DO YOU SUPPOSE ABBIE AND DURKA ARE GETTING ALONG IN HOUSTON ?

IF ROGERS GAVE THEM THE SAME CARE THEY APPLY IN THEIR GEOPHYSICAL WORK, YOU CAN REST ASSURED THEY'RE IN GOOD HANDS.

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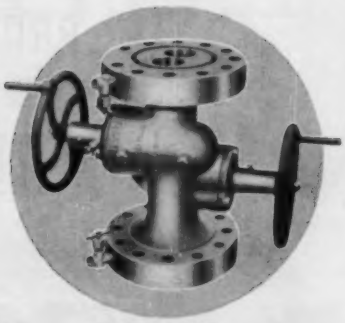
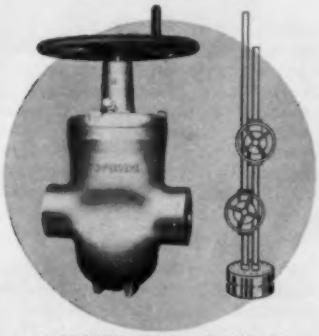


DUAL VALVES
Sizes: 1½" x 1½", 1¾" x 1¾", 2" x 2", 2½" x 2½", 2" x 2½" and 2½" x 3".

TRIPLE VALVES
Size: 2" x 2" x 2".



RECESSED BODY VALVES
Sizes: 1½", 1¾", 2", 2½" and 3". Right Side or Left Side Recessed as ordered.

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Write Dept. A-1209 for Bulletin WP 1057 for full information on W-K-M Valves for multiple completion. For complete details on W-K-M oil field valves, ask for Catalog 200.

The same efficient flow control provided by standard W-K-M Through-Conduit Gate Valves is available for multiple completions with the W-K-M Dual, Triple and Recessed Body Gate Valves.

These valves provide turbulence-free through-conduit flow, W-K-M's exclusive CONTROLLED FORCE SEATING, DOUBLE-TIGHT SEALS* at both upstream and downstream seats and all the other important advantages of W-K-M standard valves.

Specify the W-K-M Dual and Triple Completion Valves for the most efficient trees. Where economy is paramount, specify the W-K-M Recessed Body Valve . . . identical internally with standard W-K-M Valves, but with a body recess to allow the necessary close fit between tubing strings.

MANUFACTURERS OF W-K-M GATE VALVES · ACF LUBRICATED PLUG VALVES · KEY-KAST ALLOY STEEL PIPING FITTINGS · KEY RETURN BENDS AND FITTINGS

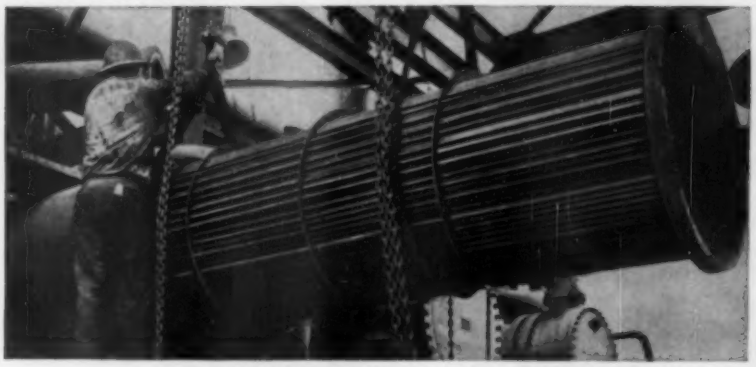
8726

BRIDGEPORT BRASS COMPANY

CONDENSER AND HEAT EXCHANGER TUBE EDITION

COPPER ALLOY BULLETIN

Bridgeport Brass Co. MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL



Replacing a copper alloy tube bundle after cleaning.

How to Reduce Exchanger Maintenance Costs by Using Performance Records

Although tube and shell heat exchangers fall into well-defined classes of design and operation, the variables in each exchanger situation make it an "individual" in respect to performance or corrosion failure. For this reason, comprehensive and continuing performance records on each exchanger are essential in achieving maximum operating efficiency and productivity.

Why Keep Records?

The primary purpose is to establish a performance pattern which will suggest a minimum though adequate maintenance schedule. Proper records should also help to detect variations in operating conditions which, though slight, may require significant changes in maintenance scheduling.

Tube Selection Important

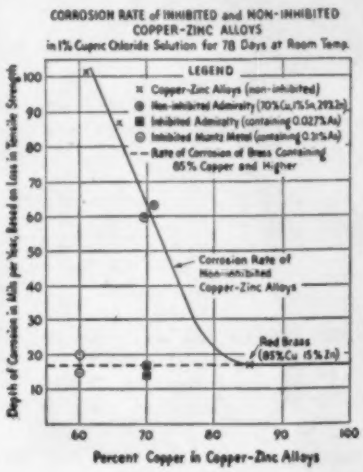
Such performance records can also help determine whether or not the best exchanger design or tube alloy is being used. For example, although Bridgeport Arsenical Admiralty or Arsenical Muntz would ordinarily be indicated for saline or brackish cooling water, adequate records will often reveal that Bridgeport Duplex, Copper, Red Brass, Arsenical Aluminum Brass, Duronze IV or occasionally 70-30 Cupro Nickel would be more economical.

Preplanning and Scheduling

Another benefit in adequate record-keeping is in the preplanning of maintenance repairs. The nature and extent of the maintenance can be known and prepared for previous to shutdown, permitting servicing with minimum loss to operating time. Likewise, sufficient lead time can be allowed in ordering tube replacements or in obtaining qualified technical help in determining the proper tube alloy to use if this is indicated.

Watch Those "Variables"

A file of records does not in itself constitute a maintenance program. Instead, critical evaluation must be made of each report so that existing maintenance schedules may be confirmed or altered. A particularly keen eye should be kept on those variables not normally recorded by the operating staff. Minor changes in water composition or product streams may not be important in production, but may significantly affect fouling or corrosion rates. For instance, in petroleum refining and petrochemical processing, the hydrocarbons have virtually no effect on copper and its alloys. But the presence of sulfides, chlorides, acids, ammonia, gases and moisture influenced by variations in temperatures, velocity and pressure will have an important effect on corrosion. Thus, where conditions such as these are detected, and where operational adjustments are not feasible, consideration should be given to the use of the other copper-base alloys or Duplex tubing.



Records Help Lick Dual Corrosion

Another advantage of adequate record-keeping is in high-lighting the need for maintenance-reducing techniques. For example, under some conditions, the use of higher grade components, such as Duplex tubes, proves economical when yearly costs are totaled up. The experience of one refinery demonstrates this point. In an exchange between ammonia and hydrogen sulfide bearing propane gas and river water, the continual failure of steel and red brass tubes made it necessary to retube the exchangers every one or two years. A change-over to Bridgeport Duplex Tubes—with low carbon steel on the product side and red brass on the water side—resulted in an average life of from 6 to 10 years.

Technical Service

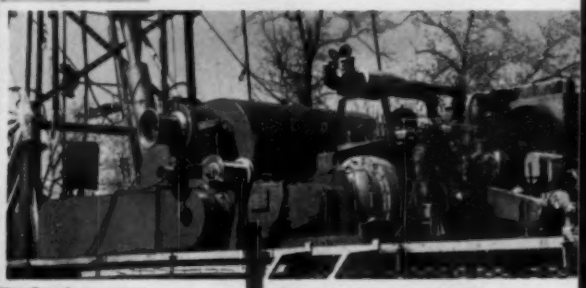
These are just a few of the advantages of keeping maintenance records on performance and how they can provide a clue toward solving your corrosion problems. For more specific help, the advice and experience of Bridgeport's Technical Service and Corrosion Laboratories are at your service through your nearest Bridgeport Sales Office. This service, plus Bridgeport's extensive selection of tubes and alloys, will enable you to meet your needs faster, easier and more economically. (842)

Further Help From Bridgeport's Condenser Tube Handbook

A wealth of practical detailed information on tube condensers and heat exchangers is contained in the Bridgeport *Condenser Tube Handbook*. Anyone concerned with the specifications, operation or maintenance of such units will find it an invaluable addition to his reference library. Write for your free copy.

DEPENDABLE POWER

Power for drawworks is provided by Model 8107 GM Diesel Engine



Mud pump (C-150-B National Ideal) is powered by Model 12103 Model GM Diesel.

Johnson Drilling Company Truck-mounted portable rig in the Tyler area.

"OPERATED MORE THAN TWO YEARS WITH NO MAJOR REPAIRS."

That's how T. J. Johnson of Tyler, Texas, head of the Johnson Drilling Company, describes the new application of GM Diesel engines that powers the hard-working portable rig shown above. A Model 8107 GM Diesel Engine provides power for the Spencer-Harris Drawworks and a Model 12103 GM Diesel Engine operates the mud pump. This well, in the Tyler area, was drilled to 6300 feet with 3½-inch drill pipe and eight drill collars.

Stewart & Stevenson — Industrial Power & Supply Co. parts and service? "Most satisfactory," says Mr. Johnson.

And here are this contractor's ratings of other important factors:
Performance — "Superior."

Dependability — "Engines are ready to deliver at any time called upon."

Power — "The two-cycle system gives fast, positive power at all times."

Dependable and economical power — the best in service — those are the characteristics of Stewart & Stevenson Services, Inc., and their dependable dealers, which have made the company the world's largest distributor of diesel engines.

Drilling is highly competitive today. The difference may be in your power and Stewart & Stevenson has the difference.

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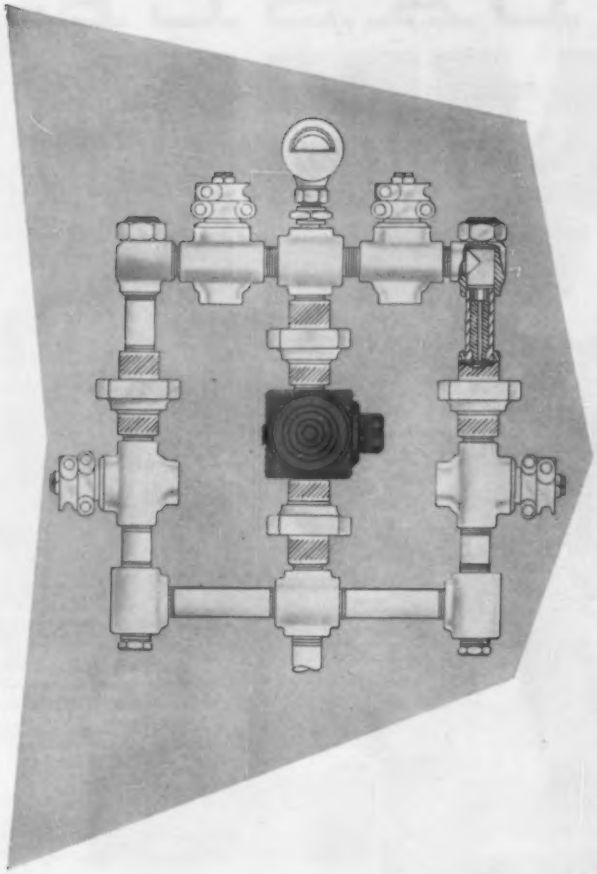

CONTROL-ABILITY

WITH

HALLIBURTON'S SURFACE CONTROL EQUIPMENT

Because proper control is vital to all successful formation testing operations, Halliburton Surface Control Equipment has been designed to effectively direct the flow of formation fluid with maximum safety. A flexible combination of integrated parts, this equipment is used to stop the flow of fluid from the drill pipe, to divert the flow to tank or pit, and to control or gauge the rate of flow. Suitable for both high and low pressure applications, Halliburton Surface Control Equipment permits rotation of the drill pipe and control head without disturbing surface connections. The result: A faster, safer, more efficient procedure for formation testing.

Halliburton Surface Control Equipment may also be readily adapted for effective control in fracturing, squeeze cementing and other oil well service operations.

See your nearby Halliburton representative... get more information about this versatile equipment. He'll be glad to describe the benefits of safe and positive control in greater detail.

HALLIBURTON

OIL WELL CEMENTING COMPANY, DUNCAN, OKLAHOMA

for better drill stem testing

CONTROL HEAD
SWIVEL, TYPE C.B.

Heart of the Halliburton Surface Control System is the Control Head which includes a master control valve to shut in the well, a back pressure valve that will prevent flow from the drill pipe yet allows pumping if necessary, and a swivel to permit operation of subsurface tools without breaking surface connections. Removable abrasion-resistant ceramic or tungsten carbide chokes, installed in the manifold, enable the operator, by substituting alternate choke sizes, to change the rate of flow during the test without shutting in the well. The flowing hose is attached to the manifold to carry the flow away from the well head to the desired receptacle; both low pressure rubber hose and high pressure steel hose are available.

Not all of these components are required on all tests, but the combination described above provides maximum effective control for the most severe testing operations.

Another reason why Halliburton's best for your drill stem test!

TESTING SERVICE

FOR TESTING RESULTS YOU CAN TRUST

401 cu. in.
461 cu. in.
549 cu. in.
International V8's

Read why fleet owners say:

"They're the hottest thing in our fleet!"

Enthusiastic owners of new INTERNATIONAL heavy-duty V-8 trucks have nothing but praise for these all-truck-built power plants. On-the-job performance has proven they are first-class profit-makers.

Road time is cut by maintaining higher sustained speeds with less shifting. Outstanding fuel economy and proper gearing result in more ton-miles per gallon. Latest reports show these V-8's stay on the job longer, too.

See how these new truck-type V-8's are making out on jobs similar to your operation by looking over convincing owner reports at your INTERNATIONAL Dealer. While you are there, get behind the wheel and experience the greatest performance of any V-8 truck in the world.

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Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

Oil Pipe Hauler: "We haul 42,000 lbs. net payload of oil-field pipe over mountainous terrain. In the first 6 months of operation of our INTERNATIONAL V-8 truck we have had no engine expense, average 5 to 5½ miles per gallon of gas!"

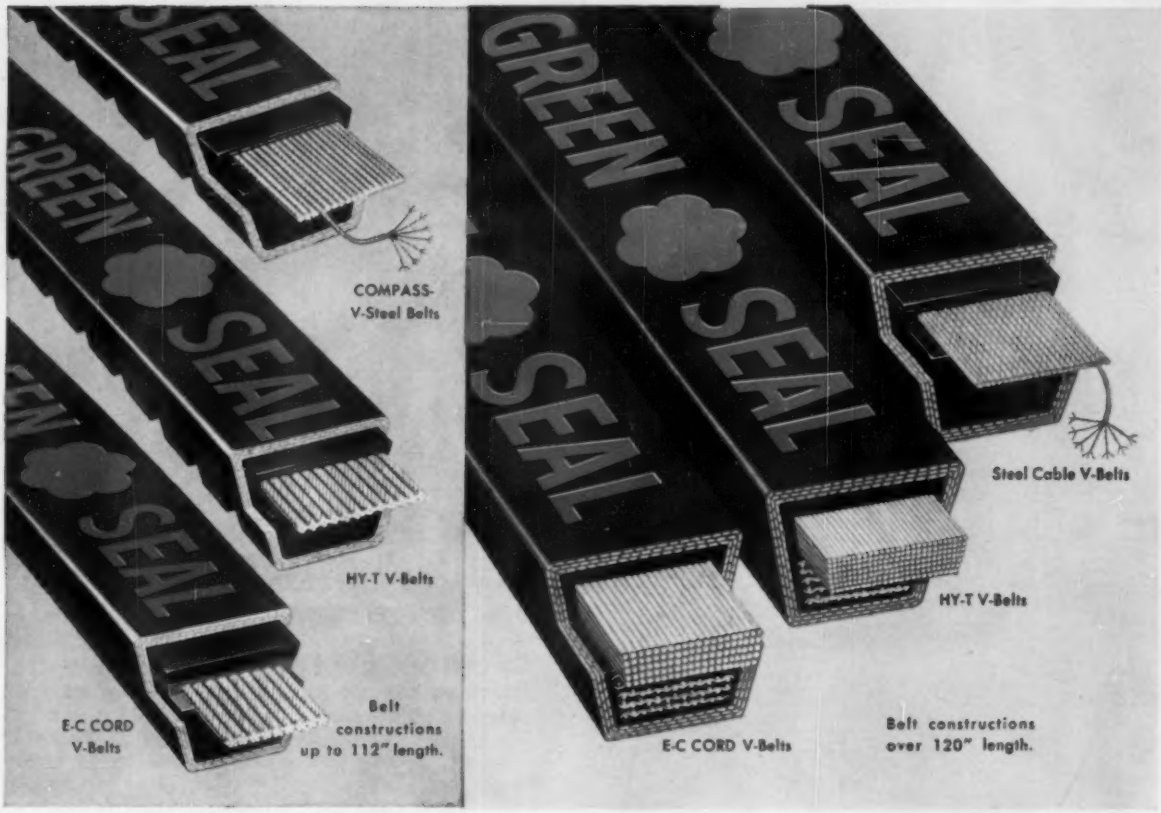
General Contractor: "My INTERNATIONAL V-8's have outperformed every competitive make under any and all conditions. We are most happy with the model VF-190A dump . . . I would recommend it to anyone using 8-10 yard dump trucks."

Steel Hauler: "We average 40,000 lbs. of steel per load. Trips range up to 125 miles with a lot of stop-and-start driving. With our INTERNATIONAL V-8 there's less shifting on hills, it holds speed better, makes better time, keeps up with traffic."

INTERNATIONAL TRUCKS cost least to own!

Do you know the inside story of

V-Belts with the Green Seal?



Until recently dimensional stability was possible only in V-Belts with steel load-carriers as developed by Goodyear. But now you can have that stability in a complete line of belts – thanks to the development of Triple-Tempered (3-T) cord–synthetic cord tempered by Tension, Temperature and Time.

What's your pay-off from this dimensional stability?

When you're belting multiple drives, it's your one guarantee that every set of matched belts will *really* match. No matter how long you store them, they'll *stay* matched, too.

And once they're installed, you've got belts designed and built to work as a perfect team–without individual belts either "loafing" or overworking. In fact, you're protected from all the usual mismatching headaches that also include slipping, stretching, scorching.

In other words, you're belted for maximum trouble-free horsepower hours at minimum cost. There's no substitute for that kind of performance – or for the V-Belts with the Green Seal that give it to you – every time.

So see your dealer about the V-Belts with true dimensional stability–the V-Belts with the Green Seal. Or write Goodyear, Industrial Products Division, Lincoln 2, Nebraska, or Akron 16, Ohio.

DIMENSIONALLY STABLE V-BELTS
with the GREEN SEAL by

GOODYEAR

THE GREATEST NAME IN RUBBER

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Watch "Goodyear Theater" on TV – every other Monday 9:30 P.M., E.S.T.

This Wheland HP-8000 handles above average pressures for slim hole operations, yet is easily portable according to Mr. Harold Black, Owner (right). At left is Mr. W. E. Riley, Pusher.

Here is Black Drilling Co.'s streamlined unit, which was designed around their efficient HP-8000 Wheland Pump.

P. O. Box 606

Phone 25

Black Drilling Company

ALBANY, TEXAS

June 8, 1957

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

The HP 8000 Wheland Pump, which we put in service in January, is more than meeting our specifications. We required a pump that would handle above average pressures for our slim hole operations and yet adapt itself to our plan of streamlining and portability. Our streamlined unit, which was designed around your pump, has cut our moving and rig-up time by 50% and increased our bit footage and penetration rates by 20%.

The performance of this pump and your field service has more than justified our choice of a Wheland.

Very truly yours,

BLACK DRILLING COMPANY

Harold Black

Harold Black

•Improved Performance
•Greater Portability

WHELAND

HP-8000 DUPLEX SLUSH PUMP
7-¼" x 12", 220 HP Nominal Input at 70 RPM

"cut our moving and rig-up time by 50% . . . increased our bit footage and penetration rates by 20%"

—Mr. Harold Black, Owner

The biggest little pump on the market!

Wheland builds a complete Line of Efficient Slush Pumps designed to give you Dependable Operation, Lower Maintenance. Write for Detailed Bulletins.

WHELAND

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THE WHELAND COMPANY

CHATTANOOGA, TENNESSEE, U.S.A.

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CROWN BLOCKS • TRAVELING BLOCKS • SWIVELS

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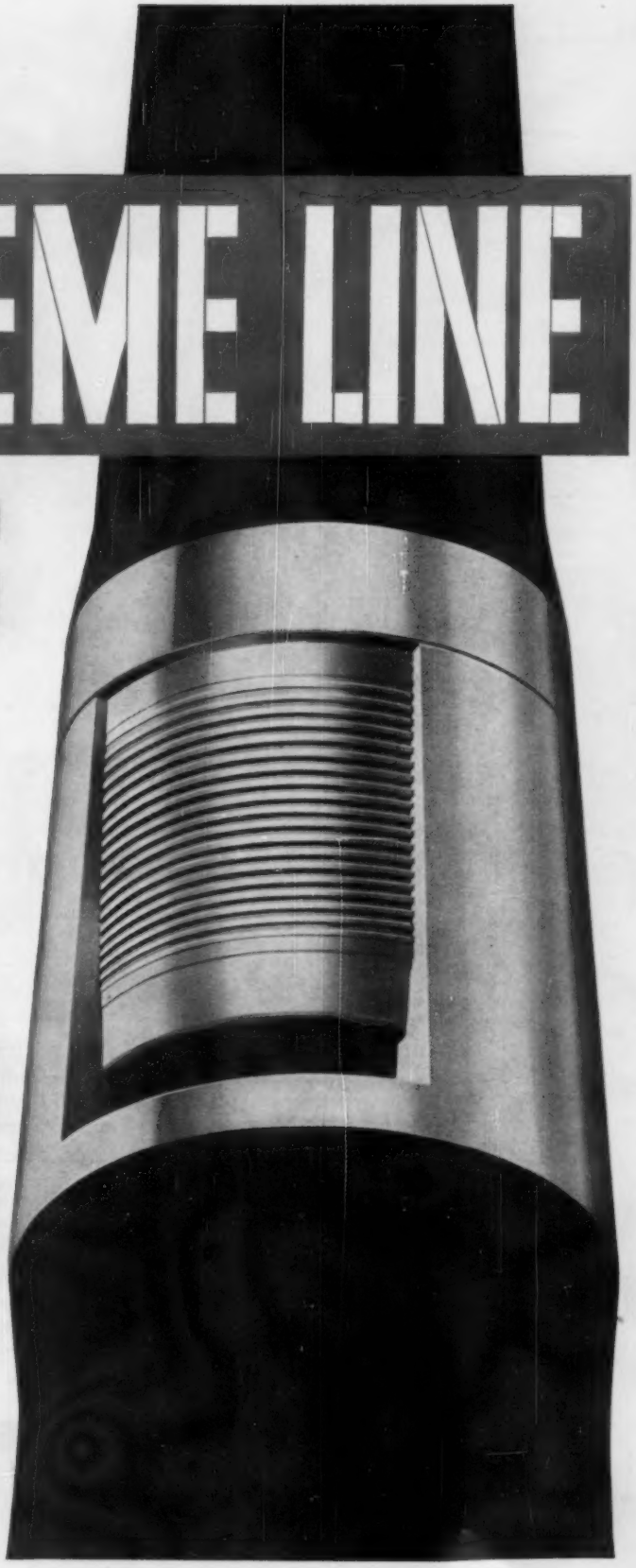
EXPORT DISTRIBUTORS: LUCEY EXPORT CORPORATION—233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.

J&L EXTREME LINE CASING

for deep wells

- High strength joint
- 100% leak resistant

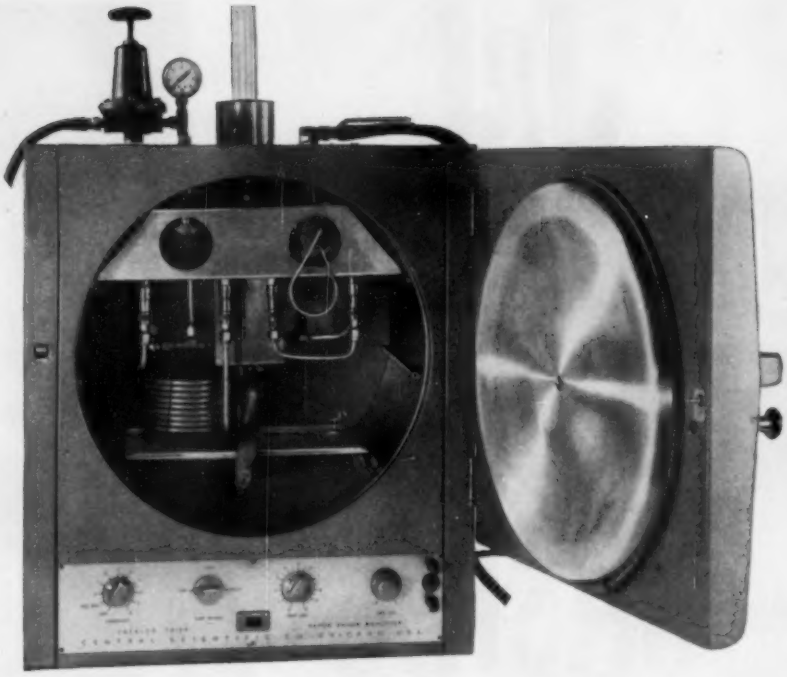
J&L Extreme Line casing meets the challenge of your toughest deep well problems. Check the unusual advantages of this new J&L casing available in grades J-55, N-80 and P-110. Produced under license from The National Supply Co. Write to Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa.



High joint strength. A modified Acme-type (rectangular thread form) thread with a steep flank angle assures a strong interlock, takes tensional loads in shear.

100% leak resistant. Separate sealing surfaces lock together when two lengths of casing are joined. Seal consists of a curved surface extending beyond the male threads and a tapered conical seat beyond the inside end of the mating female threads. The number of threaded connections is halved.

J&L STEEL **Jones & Laughlin** ...a great name in steel



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CENCO® vapor phase analyzer

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No. 70130 Cenco Vapor Phase Analyzer comes equipped with Gow-Mac detection cell, sensitive pressure regulator, flowmeter 1 to 83 ml/min range, 10 ft. coiled column of Di-2-ethylhexyl phthalate, syringe, temperature controls, thermometer, built-in regulated power supply, but without recorder..... **$895.00**

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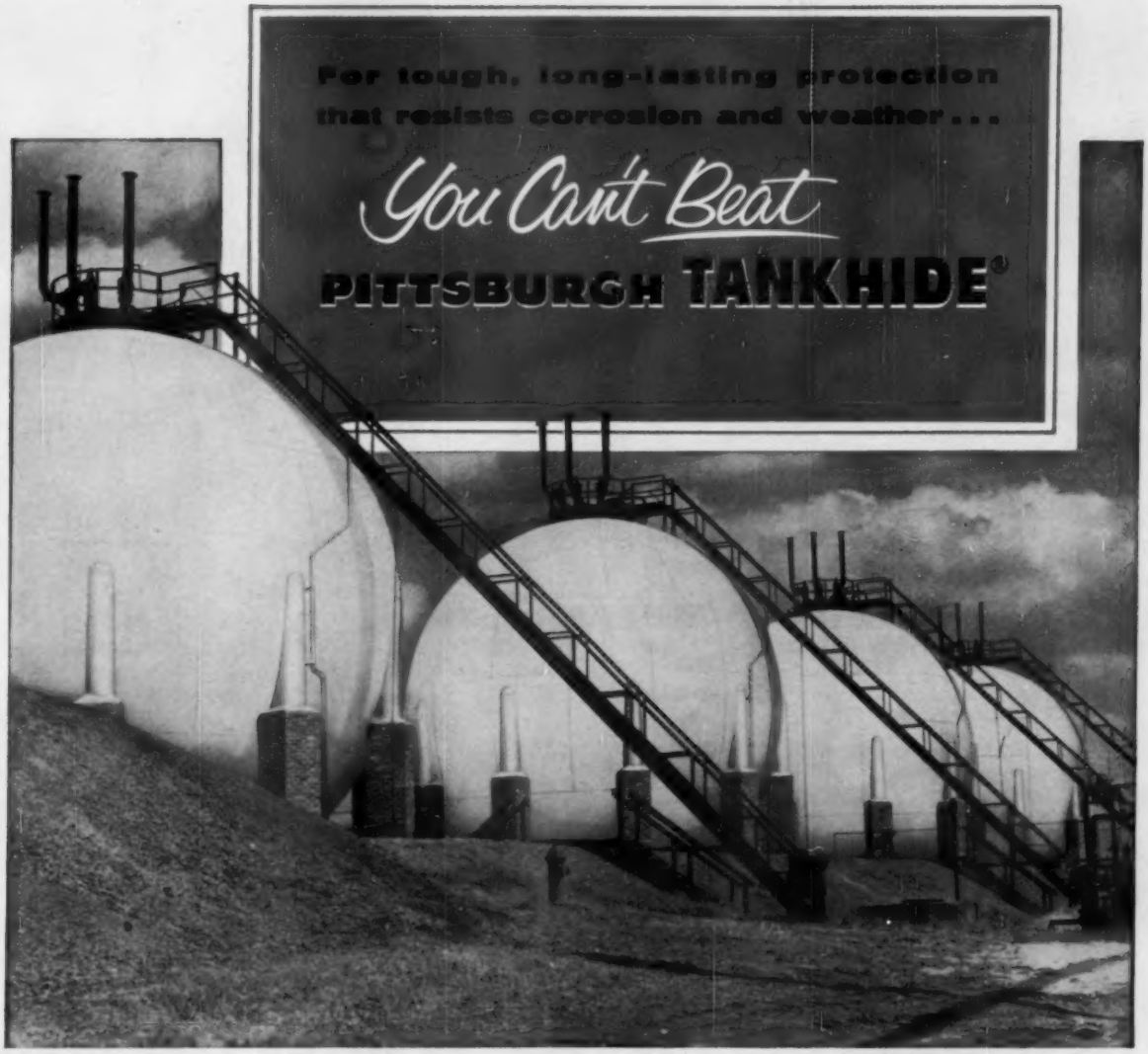


WHEN YOU'RE LOOKING for exceptional toughness and durability in a finish for gasoline and oil storage tanks, you'll choose Pittsburgh's brilliant White TANKHIDE.

Here's a tough, long-lasting coating that saves you money in two important ways. Its special pigments and vehicles withstand corrosion and weather. Its high heat and light reflection reduce loss of tank contents caused by evaporation.

White TANKHIDE gives you one-coat hiding—can be brushed on when spraying is impractical. Its quick set and firmness of film during drying period prevent collection of dirt and insects, reduce damage from rain, scuffing and abrasion to a minimum. Self-cleaning action maintains its gleaming whiteness throughout its long life.

TANKHIDE is also available in synthetic gray and black as well as in gray and black oil-base finishes that can be used on metal or wood surfaces with equally good results.

Pittsburgh provides a wide variety of high quality finishes for every need in the petroleum industry. Our wide experience in this field often can save you valuable time and money. Write, wire or phone Pittsburgh Plate Glass Company, Industrial Paint Division, 1 Gateway Center, Pittsburgh, Pa.

PPG

PITTSBURGH PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

NEW HUSTLE FOR '58... CHEVY LIGHT,

More horsepower . . . more staying power in V8's and 6's!

New Chevrolet trucks bring you higher efficiency horsepower right up the line, including a revolutionary new V8 development for heavyweights. Here are engines designed to work for you . . . to save for you . . . to give you more power than ever before!

If you use light-duty trucks, there's new standard power in every '58 Chevy model . . . a more powerful (145-h.p.!) edition of the engine most famous for economy and dependability, the rugged Thriftmaster 6. And the optional (extra-cost) Trademaster V8 is *all new* and all set to go to work with 160 h.p., 283 cubic inches of displacement, short-stroke efficiency and weight-saving compactness.

Chevrolet for '58 is here with new medium- and heavy-duty power, too! Standard in Series 50 L.C.F. models is a new version of the Heavy-Duty Taskmaster V8, with plenty of power for fleet hauling and new durability features such as Stellite-faced exhaust valves and induction-hardened exhaust valve seats. Series 60 models provide the time-proved Jobmaster 6 with more power than

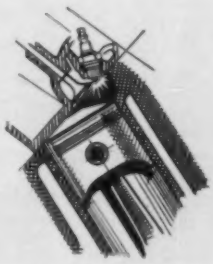
CHEVROLET **NEW CHEVROLET**

MEDIUM, AND HEAVY-DUTY HAULERS

ever—150 h.p.—and a host of new features that mean more economy and dependability on jobs that work a truck hard.

And Series 70 and 80 models come equipped with a big 175-h.p. Heavy-Duty Super Taskmaster V8 newly fitted out with a lineup of advanced, rugged components; this engine is designed to pull mammoth payloads with ease.

But that's not all! Series 90 and 100 models offer a *new kind* of big truck engine, the 230-h.p. Workmaster V8, with radical Wedge-Head design that develops high power and torque at fuel-saving low r.p.m. See your nearby Chevrolet dealer and *save* with Chevy's new brand of hustle! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.



RADICAL NEW WEDGE-HEAD DESIGN

In the Workmaster V8, a new kind of combustion chamber gets *extra power* with top economy from regular grade fuel! Cylinder block is machined at 16-degree slant, pistons are of new "peaked" design.

Latest editions of the "Big Wheel" in trucks

TASK · FORCE 58 TRUCKS

Did You Ever See a Double Headed Pump?

This unusual installation is operated by Low-Cost Utility Electric Power

Pumping from different depths but through the same casing, these pumps can be operated simultaneously or singly. Each is operated by AUTOMATICALLY CONTROLLED push-button power – ELECTRIC POWER.

While such installations are not common, it is standard procedure in most fields today to utilize Utility Electric Power because of the overall LOWER COST, greater efficiency, and numerous special benefits.

For helpful counsel on how you can benefit, call the Power Engineer of your Utility Electric Service Company.

I'm LCP – Low-Cost Power ON THE JOB – 24 HOURS DAILY.

PETROLEUM ELECTRIC POWER ASSOCIATION

P. O. BOX 35006 DALLAS, TEXAS

They Come Big for Gulf's New Platformers

The two new 26,000 b/d Platforming® units for Gulf Oil Corporation's Philadelphia refinery called for giant carbon steel towers to handle this large volume. The biggest, a pair of prefractionating columns 106½ feet tall, are said to be the longest ever shipped into Philadelphia in one piece. Built under license from Universal Oil Products Company, the installation will be used for producing high octane gasolines. The general contractor is Procon, Incorporated. Two sets of nine towers were shop-fabricated by Graver. The fabrication of these and other large towers is handled with ease in Graver's nation-wide facilities, always ample to meet the demand for bigger and more efficiently fabricated processing equipment.

GRAVER®

Building for the Future on a Century of Craftsmanship in Steels and Alloys

GRAVER TANK & MFG. CO., INC.

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Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

Glycol Dehydrators give 90°F. Dew Point Depressions...

Improved regeneration systems give high glycol concentrations

There are two methods commonly used today to dehydrate natural gas: one employs glycols; the other, dry desiccants. Most authorities agree that glycol systems are less expensive in both initial and operating costs. Recent engineering advances now permit dew point depressions up to 90°F. with economical glycol-type dehydrators. Union Carbide Chemicals Company maintains an extensive engineering service group designed to help the natural gas industry obtain the best possible dehydration service with CARBIDE's diethylene glycol and triethylene glycol.

A GRADUAL IMPROVEMENT

Diethylene glycol was first used to dehydrate natural gas in 1936 and by 1939 sixteen glycol type plants were in service providing average dew point depressions in the range of 40°F. Triethylene glycol was first used to dehydrate natural gas in 1949. The dew point depressions realized with glycol type plants have gradually increased until today the standard guarantee is a 65°F. depression or gas containing seven pounds of water per MMSCF, whichever first occurs. For sometime now, some equipment manufacturers have offered a 75°F. dew point depression guarantee.

FACTORS INFLUENCING DEW POINT DEPRESSION

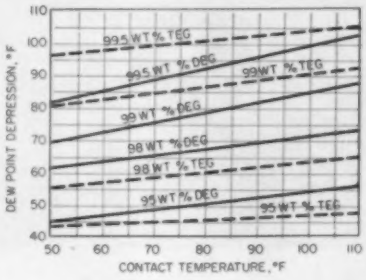
The dew-point depression obtained with a glycol dehydration plant depends upon several factors, such as:

1. Concentration of water in the lean glycol solution.
2. Glycol circulation rate.
3. Contact temperature in the top of the absorber column.
4. Efficiency of gas to glycol contact in the absorber.

Even with conservative design and operation, however, the dew point of the gas leaving the glycol contactor cannot be lower than the equilibrium value for the conditions of temperature and glycol concentration found on the top plate.

HIGH GLYCOL CONCENTRATIONS

The high diethylene and triethylene glycol concentrations now being obtained in plant practice, prompted studies to determine the dew point depressions obtainable with such solutions.



These data indicate that both diethylene and triethylene glycol at 99.5 per cent concentrations provide dew-point depressions in the 80°-105°F. range.

At concentrations of 98 per cent and lower, diethylene glycol provides better depressions than equal concentrations of triethylene glycol, while at 99 and 99.5 per cent concentrations, triethylene glycol appears to allow a 5°-10°F. lower dew point than diethylene glycol.

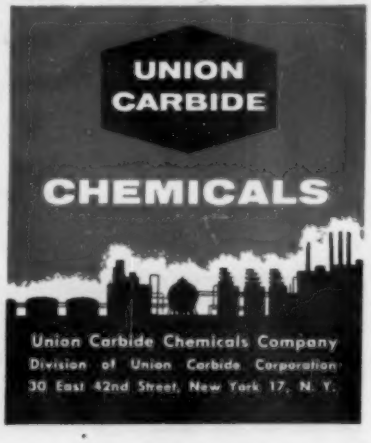
90°F. DEPRESSION MEETS TRANSMISSION REQUIREMENTS

Glycol regeneration equipment on the market today is capable of producing and maintaining glycol concentrations above 99%. Thus, it is possible for equipment manufacturers to guarantee a 90°F. minimum dew point depression. There are very few instances where a 90°F. depression will not meet the water content specifications of any long distance gas transmission company.

CARBIDE'S RESEARCH PROGRAM

Dew point depression studies are but one phase of CARBIDE's extensive research activities designed to improve the products and processes of the natural gas treating industry. CARBIDE's Technical Service Department stands ready to help you obtain the best possible results from your gas treating installations. For more information on the use of CARBIDE's glycols for gas dehydration, call the nearest CARBIDE technical representative or write, Union Carbide Chemicals Company, Department B, 30 East 42nd Street, New York 17, N. Y.

"Union Carbide" is a registered trade-mark of Union Carbide Corporation



ADVANCED DESIGN HYDRAMOTOR

A MOTOR VALVE YOU CAN USE ANYWHERE!

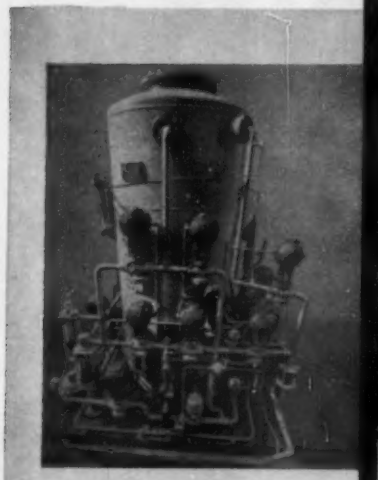
Here is a motor valve that's truly versatile... the General Controls Hydramotor! A complete line covers positive shut-off control for gases and liquids at all pressures, and they're at home anywhere, inside or out, hot or cold.

Simple, rugged electro-hydraulic operators operate on two-wire electrical circuits... they fail-safe under powerful steel spring closure in the event of power interruption. Fast and slow opening and closing speeds available.

Write today for the complete Hydramotor Catalog, or contact the nearest General Controls branch listed in the yellow pages.

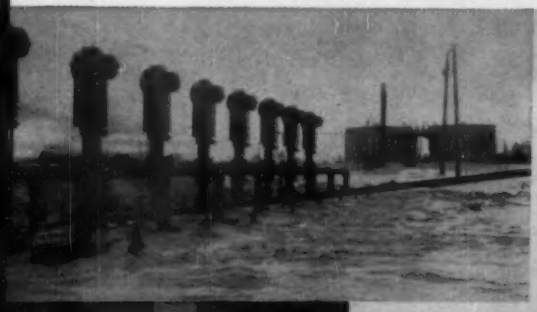
GENERAL CONTROLS HYDRAMOTOR ®

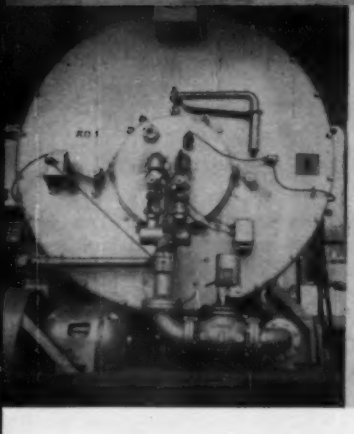
Hydramotor H-3—This model has cast carbon steel body gate for tight shut-off of gas, oil or liquids. 1000 psi. Motor is explosion-proof, weather-proof. Typical use: high pressure shut-off on oil wells.



NO BRAWN NEEDED

This ion exchange chamber for boiler feedwater treatment has 17 Hydramotors for flow control. The boiler room crew can busy itself on more important duties than tending valves!





RUGGED, OUTDOOR TYPE

These gathering system valves are always ready. A simple two-wire circuit is all you need to control a Hydramotor. It works easily at any temperature... arctic cold or desert heat, where personnel couldn't ordinarily reach a manual valve.

POSITIVE SHUT-OFF

sold this package boiler manufacturer on applying this Hydramotor on the fuel line to this big gas-fired boiler... he wanted positive shut-off, tight sealing, in current failure or "over temperature" situations. FM & U.L. approved.

Five Plants:
Glendale, California
Burbank, California
Iron Mountain, Michigan
Skokie, Illinois
Guelph, Canada

GENERAL CONTROLS

America's Finest Automatic Controls for Home, Industry, and the Military

Factory Branch Offices Serving *All* Principal Cities of the United States and Canada

This man is not rusty on corrosion

(Modern techniques with glycols help him control moisture content of natural gas)

Yesterday's answer to a corrosion or dehydrating problem may not be good enough tomorrow. There may be a better way. That's why gas conditioning case histories—unsolved problems as well as success stories—continually pour into Dow labs to be studied and evaluated.

For only by analyzing what is being done in the field—and improvising and improving on accepted methods—can our technical service men come up with the best use of glycols and ethanolamines.

Often it is their job to locate the problem in the treating unit. Then, by examining the gas composition, pressures, temperatures, presence of oxygen and other factors, they must determine the most efficient and economical solution. This requires an acquaintanceship with advanced methods and techniques.

By keeping our tech service men well-polished on corrosion, Dow offers glycol and ethanolamine users a pipeline to technical information gathered from gas conditioners around the globe. A call today may save you money tomorrow. THE DOW CHEMICAL COMPANY, Midland, Mich., Dept. GD-814H-2.

YOU CAN DEPEND ON DOW

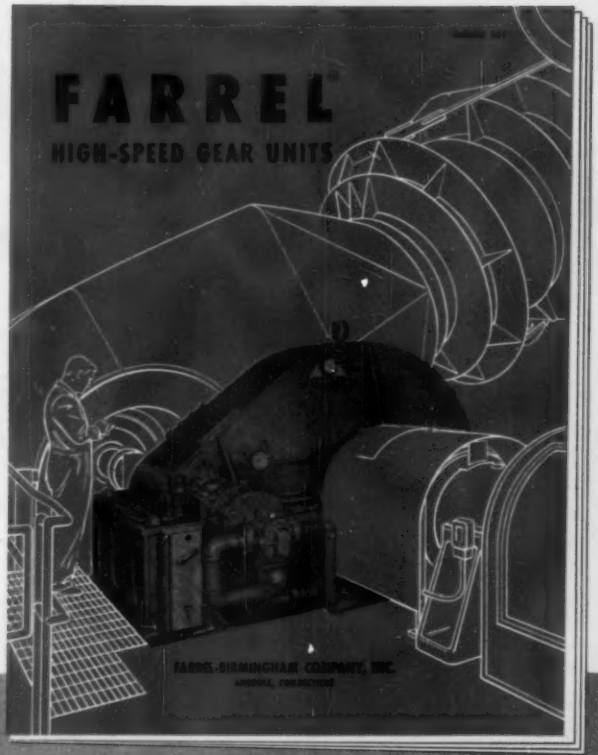
NEW REFERENCE MANUAL

... to help you choose dependable high-speed gear units

Here is one of the handiest manuals on high-speed gear units ever offered. It covers both speed-increasing and speed-reducing units.

Every one of its 28 pages is designed to help you in the efficient selection and application of Farrel SI units. Concise yet complete, the booklet makes it easy for you to choose the proper unit for long service life and trouble-free operation. Diagrams illustrate twelve alternative lubrication systems designed to meet individual requirements.

For your free copy, just fill out the coupon and mail it today.



FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

Sales Offices: Ansonia, Buffalo, Boston, Akron, Ann Arbor (Mich.), Chicago, Minneapolis, Fayetteville (N. C.), Los Angeles, Salt Lake City, Tulsa, Houston

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What the booklet contains:

- Description of the units
- General specifications
- Instructions for selecting a unit
- Selection examples
- Table of ratio factors
- Service factor table
- Table of horsepower ratings
- Ordering instructions
- Dimension drawings
- Alternate lubrication systems
- Illustrations and descriptions of eight special test-stand units
- Installation photographs
- Details of other Farrel gears and gear units

Farrel-Birmingham®

FB-1128

Engineers will find this factual manual useful in the selection of drives for a variety of applications. Send the coupon for your free copy.

FARREL-BIRMINGHAM COMPANY, INC., Ansonia, Conn.

Please send me a copy of Bulletin 451, "FARREL HIGH-SPEED GEAR UNITS."

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Company .....

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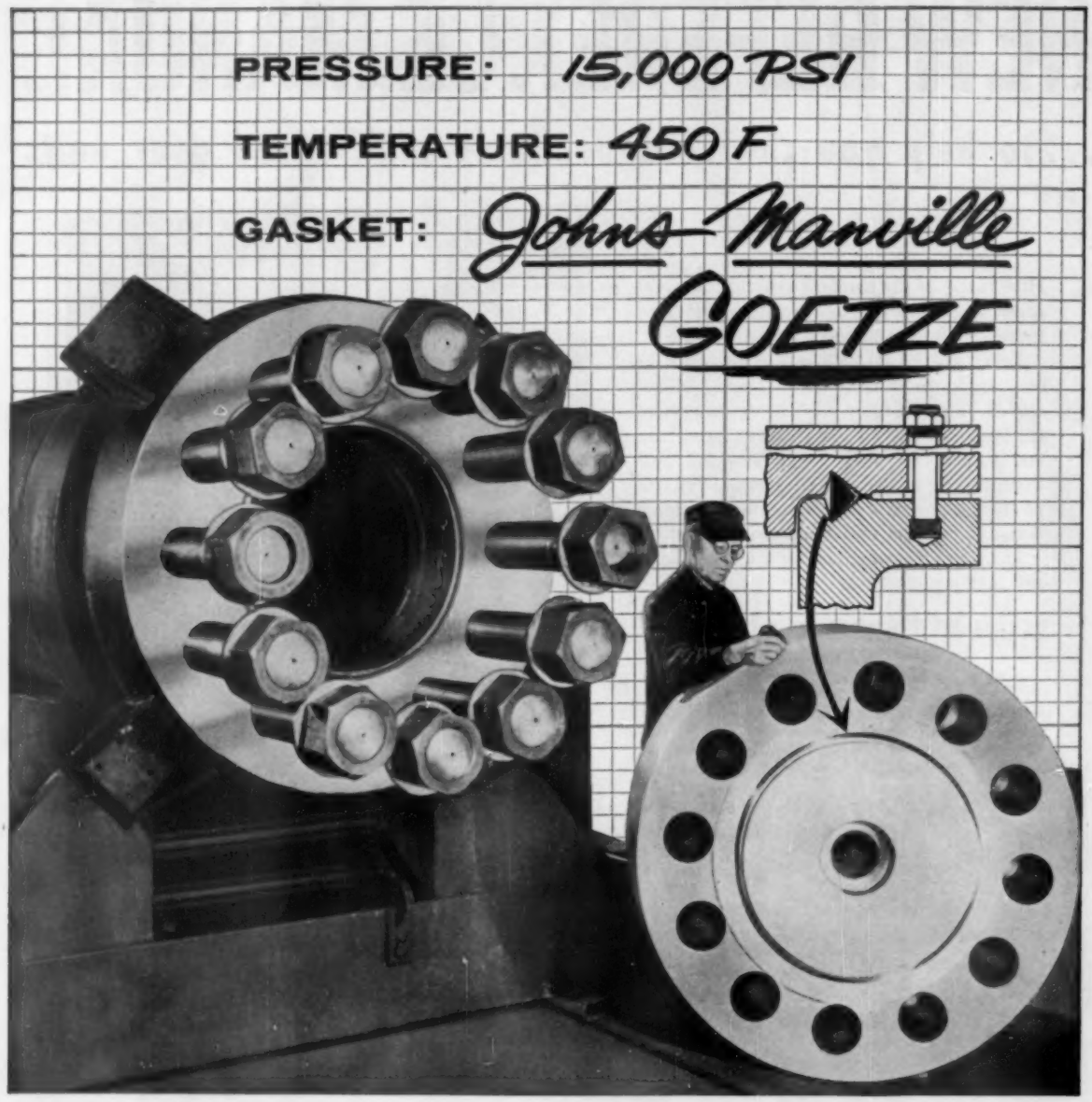
City ..... *State* .....



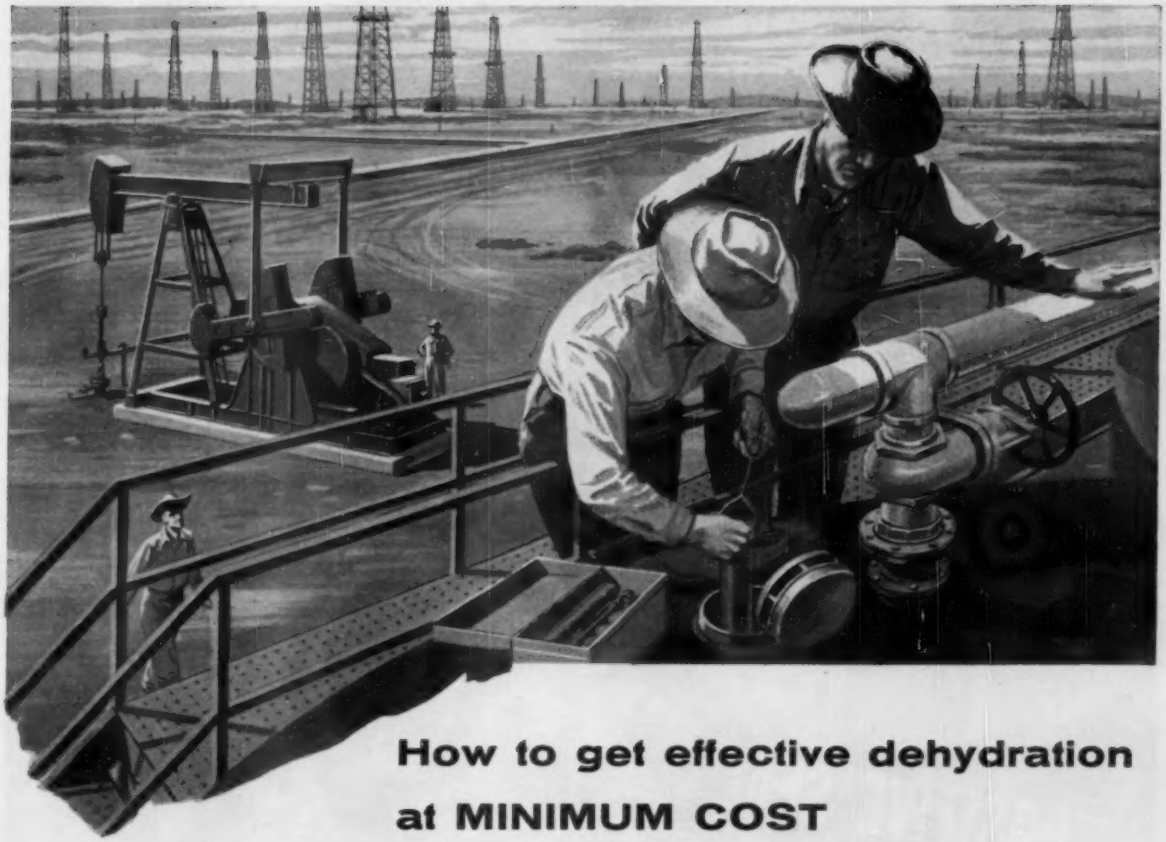
How A. O. Smith maintains tight seals in giant "Multi-Layer" vessels

Today's tremendous pressures and temperatures have placed special demands on manufacturers of processing equipment. A. O. Smith has answered this need with a special type of "Multi-Layer" vessel construction. And Johns-Manville in turn has provided gaskets that assure tight seals under these exacting conditions. Typical of these is the delta type gasket, illustrated above, which was designed, for this application, to withstand pressures up to 15,000 psi. and temperatures to 500 F.

The development of special gaskets to meet special purposes has been the stock in trade of Johns-Manville's Goetze division for more than sixty-five years. Expert technicians possess a knowledge of metals and other factors related to gasket design and performance that is unmatched in the field. What's more, intensive specialization and modern production tooling provide substantial cost savings on J-M gaskets.

If you need gaskets for high pressure vessels for similar applications, send us a drawing or template for quotation. If you have a sealing problem of any kind, J-M technicians will work directly with your own engineers to develop new gaskets —or adapt existing styles—to meet your specific requirements. Write for further information to Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

Johns-Manville PACKINGS & GASKETS

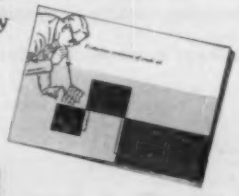


How to get effective dehydration at MINIMUM COST

Chemical treatment of crude to bring it to pipeline standards can be an economical, profitable operation—if it's done right.

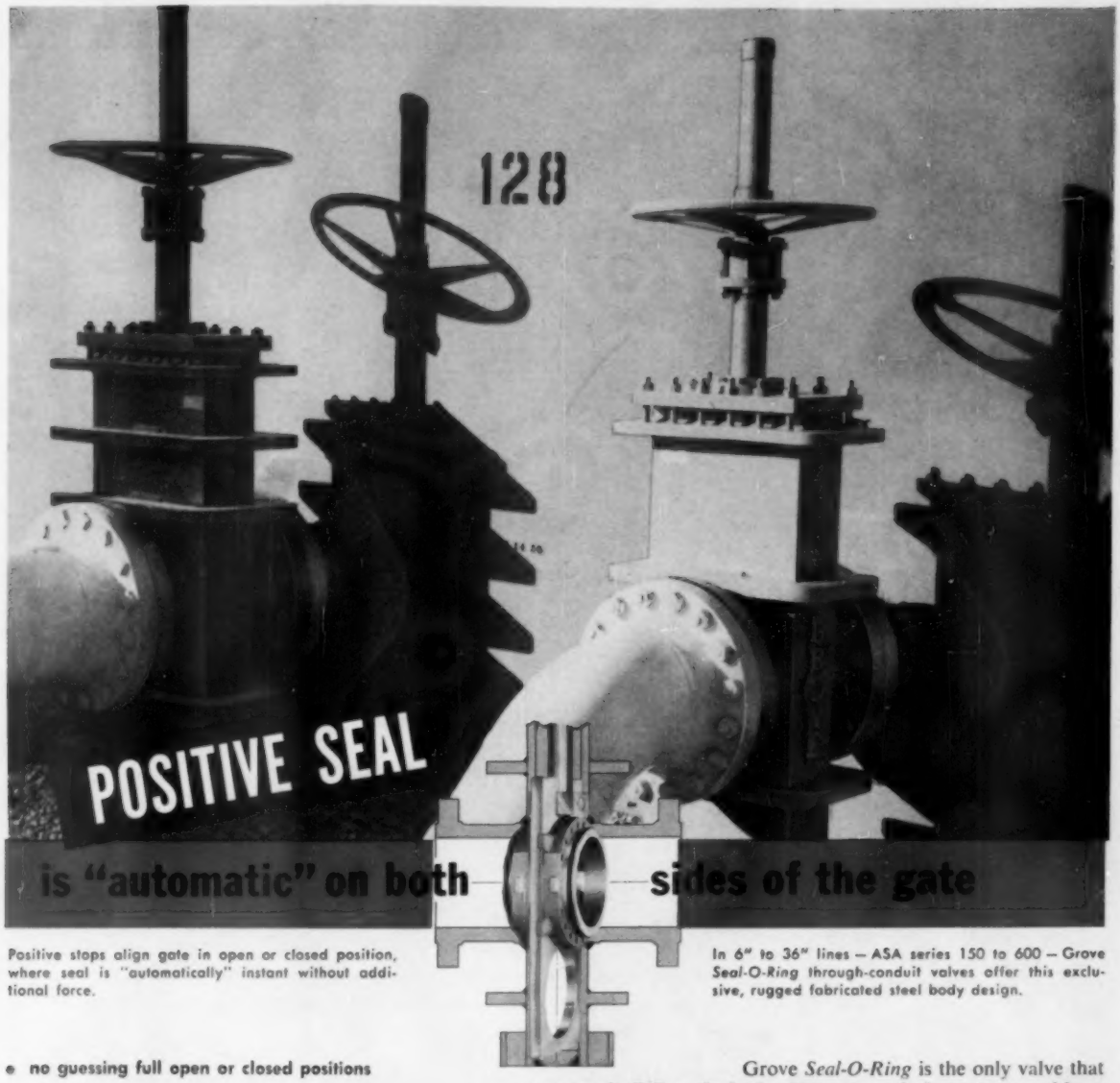
Aquaness field men work on the principle that there's only one right way to find the best answer to your well's dehydration problem. And that's by working at your well—for days, if necessary—until they get the one combination of chemicals that exactly fits your well fluids and your treating system.

This takes patience, and a lot of experience. Aquaness men know the oil industry, from years of field work in a wide range of treatment problems. And they have a complete line of uniform, high quality chemicals which they can use in almost endless combinations, to produce a broad variety of treatment effects to match your well's needs.



Write today for the new Aquaness booklet, "Production Treatment of Crude Oil."

Aquaness *Department*
ATLAS POWDER COMPANY
2005 Quitman Street, Houston 26, Texas



Positive stops align gate in open or closed position, where seal is "automatically" instant without additional force.

In 6" to 36" lines – ASA series 150 to 600 – Grove *Seal-O-Ring* through-conduit valves offer this exclusive, rugged fabricated steel body design.

- no guessing full open or closed positions
- no additional torque required to seal
- no dependence on lubricants or sealing compounds
- no wedging, sticking or distortion
- not subject to temperature changes

Grove *Seal-O-Ring* is the only valve that "automatically" seals both upstream and downstream without requiring operator's judgment on "how tight to close it"—or on presence of sealing compound. Full floating, self aligning, parallel sided gate and seats are never distorted or misaligned by wedging or thermal expansion or contraction. Seats are always in contact with the gate. With each operation, gate is stripped clean by the metal seats, and squeegeed and polished by the "O" ring seals.

For the valve that does its own thinking, and requires virtually no maintenance, specify *Seal-O-Ring*, proved in thousands of installations through many years.

709

GROVE SEAL-"O"-RING Gate Valves

SUBSIDIARY OF WALWORTH

GROVE VALVE and REGULATOR COMPANY • 6529 Hollis St., Oakland 8, Calif.
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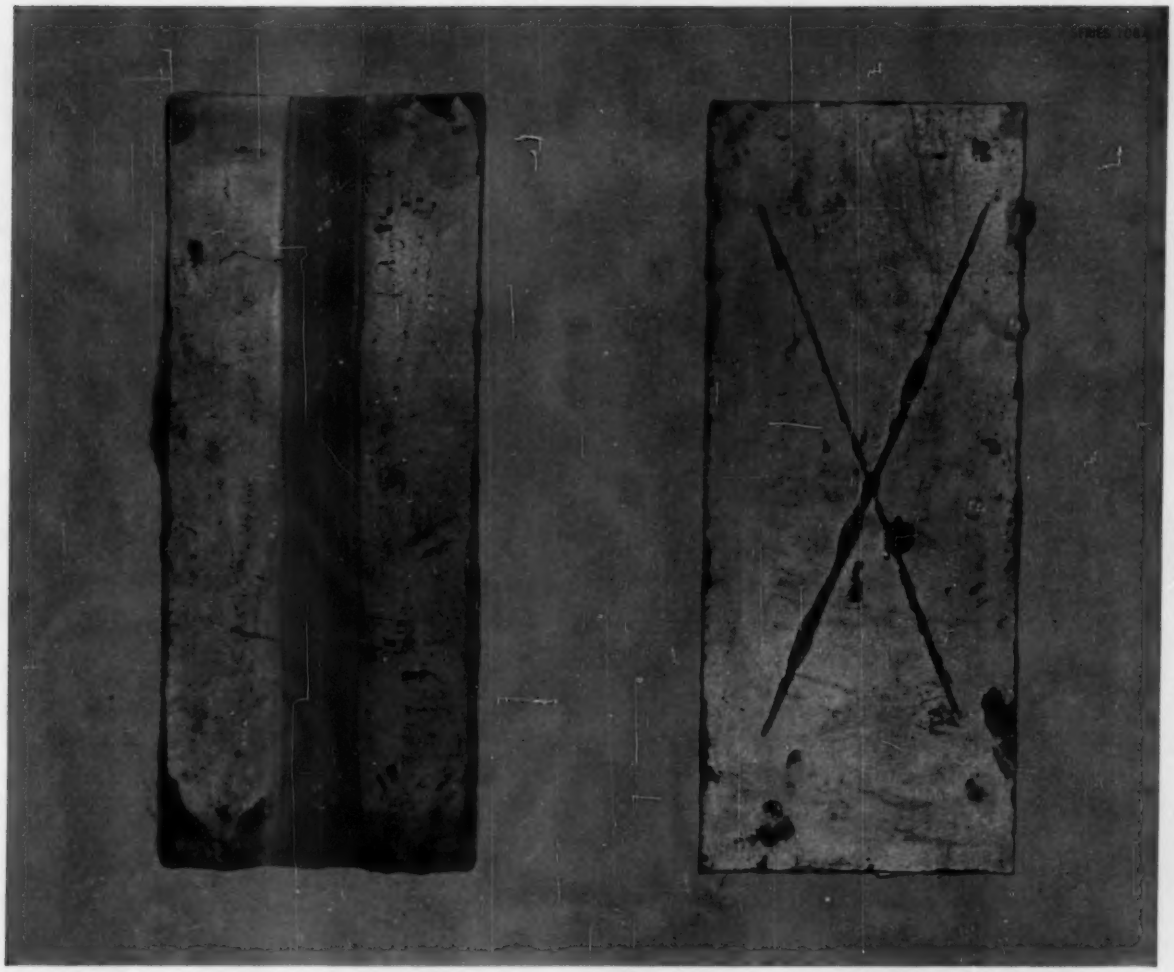
GROVE SEAL O RING ® GROVE SIMPLICITY ACCURACY SAFETY

ODESSA, TEXAS • TULSA, OKLAHOMA • CHICAGO, ILLINOIS • DENVER, COLORADO • In Western Canada: GROVE VALVE LIMITED, EDMONTON



CORROSION'S FOCAL POINTS are easy to detect with a new Amercoat testing method using iron and caustic indicators in a saline gelatin bath. On the welded and scored steel panels shown above after test, unworked surface areas turned red to indicate cathodic properties; but the weld, scores and edges turned blue (here shown blackened) to reveal themselves as anodic corrosion breeders. Rivets, threads, crevices and abrasions also show anodic under test. Unless such areas are effectively sealed from moisture, oxygen and ions they will erupt as focal points of corrosion cells.

How to protect "trouble spots" against corrosion

Ask a corrosion engineer where metal corrosion is likely to attack first. Chances are that he will name rivets, threads, sharp edges, angles, crevices and welds. These are the areas of stress concentration, work hardness, fissures and abrasions. They tend to be anodic and actually breed corrosion. And although they warrant increased protection, conventional coatings pull away from their sharp profiles and leave them inadequately covered.

Amercoat No. 87, a true vinyl mastic, protects these spots in a single coat 10 mils thick, whereas other coatings fail to build 5 mils in three coats. It cuts maintenance painting costs up to 50% because you don't have to re-erect staging and scaffolds for additional coats, and you get results that last.

No. 87 combines the time-tested chemical and weather resistance of vinyl coatings with the thickness of mastic, yet it is easily sprayed with standard equipment over a suitable primer. Available in white, gray, black and aluminum. Use it for enduring protection at lower cost per square foot per year. Complete details mailed on request.—Amercoat Corp., South Gate, Calif.

AMERCOAT Corporation, Dept. CL
4809 Firestone Blvd., South Gate, Calif.

Please send me your latest information on Amercoat No. 87.

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Amercoat® CORPORATION

EVANSTON, ILLINOIS • KENILWORTH, NEW JERSEY
JACKSONVILLE, FLORIDA • HOUSTON, TEXAS

The Sirocco Wheel—Designed with a multiple number of narrow, curved blades, forward pitched. Operating at low rotative and peripheral speeds, it delivers more air per revolution than any other type of fan.

The HS Wheel—Medium-speed wheel with true non-overloading power characteristic; features large-area die-formed blades, mounted in backwardly inclined position between heavy-duty backplate and streamline rim.

Match the wheel to the job . . . with rugged, quiet American Blower Sirocco and HS Fans!

American Blower fans have Certified Ratings for dependable performance.

American Blower's complete line of fans lets you match the wheel to the duty, whether it's ventilating, air conditioning, heating; or drying, fume-removal, and processing systems. Their heavy-duty design and construction assure you of long fan life with a minimum of maintenance. Take the Sirocco and HS fans, for example:

Sirocco and HS fans offer smooth, quiet air delivery, high operating efficiency and dependable service. They are available in 25 standard sizes from 12¼" to 132" wheel diameters for volumes to over 700,000 CFM.

Precision-built Sirocco and HS fans can be specified in single or double inlet and in any of eight standard discharges, with ball, roller or sleeve bearings as required. Inlet vanes, dampers or Gýrol Fluid Drive can be furnished to meet volume control requirements. Larger sizes are designed so that they can be dismantled for easy handling in shipment, erection and maintenance.

Get details on the complete line of American Blower fans. Call our nearest branch office; or write direct to American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

AMERICAN BLOWER

Division of **AMERICAN-Standard**

DU PONT *Petroleum Chemicals* NEWS

Number 82 in a Series of Bulletins for the Petroleum Industry

DECEMBER 1957

Here's new proof of the solubilizing power of FOA-2

DuPont Fuel Oil Additive No. 2 has long been known as an exceedingly effective fuel oil-stabilizer and sludge-dispersant and solubilizer. The first two qualities have been repeatedly demonstrated in field performance, and now the solubilizing power of the additive can be demonstrated also.

The demonstration is quite simple and can be made with no more equipment than a heat source (steam bath) and two small vials of fuel. The fuel is kerosine with a small amount of benzene containing dissolved sludge. FOA-2 is added to one of the fuel samples; then the benzene is boiled off of both samples. The time-lapse picture story (below) tells the story.

How FOA-2 solubilizes

The photos show that at the beginning sludge is soluble in the fuel, becoming insoluble

OVER

1 10:30 A.M., SEPTEMBER 23, 1957

2 10:42 A.M., SAME DAY

3 11:42 A.M., SAME DAY

4 1 P.M., SAME DAY

5 10:30 A.M., NEXT DAY

1. These bottles both contain 99% kerosine, 1% benzene and a small amount of sludge (15 mg/100ml) which is soluble in the fuel blend. To the bottle at right .01% of DuPont FOA-2 has been added. This is the proportion recommended for protecting fuel oils (30 lb./1,000 bbl.).

2. The samples have been heated for 10 minutes in boiling water to evaporate the benzene. Sludge is already starting to appear in the bottle at left, not in bottle at right.

3. Note in cut 3 agglomeration of insoluble sludge particles at left, and clarity of FOA-2 protected oil at right.

4. Sludge formation has settled to bottom. Solution at right remains clear.

5. Most of the small sludge particles in left-hand bottle have now settled. After 24 hours, FOA-2 protected oil still shows no sign of sludge precipitation, and will continue clear almost indefinitely.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT *Petroleum Chemicals* NEWS

CONTINUED *Solubilizing Action*

only when the aromatic solvent portion (benzene) is removed. The right-hand bottle shows that FOA-2 keeps the sludge soluble, whereas it gradually precipitates in the bottle at left.

FOA-2 is a long-chain polymer with a critical balance between polar and oil-soluble groups. The polar groups are attracted to non-hydrocarbon constituents or residue particles, and the soluble groups maintain good oil-solubility of the combination.

FOA-2 *stabilizes* fuel by preventing interaction of non-hydrocarbon constituents or residue-formers in the fuel. It *solubilizes* some residues which are just slightly insoluble, and *disperses* other residue particles which are quite oil-insoluble.

Benefits of the additive

These three properties of Du Pont Fuel Oil Additive No. 2 keep oils free flowing . . . devoid of sludge which could cause clogging of heating systems.

They are responsible also for FOA-2's solution of the incompatibility problem. The sludge likely to precipitate when oils are mixed does not form if sufficient FOA-2 is present; 30 lb./1,000 bbl. is usually enough to solve incompatibility.

The third important function of the additive is its cleansing of systems already fouled with sludge. This saves the costs of downtime and of having systems cleaned manually.

New book about FOA-2

We recently published a comprehensive 28-page book about FOA-2. All

the basic information you will need is included—properties, composition, use concentrations, handling and addition methods, and performance testing data. Ask any of our representatives for a copy, or drop us a line.

You ought to know . . .

CARL W. FERRIS is manager of the Du Pont Petroleum Chemicals Division's Chicago district. This district serves the tetraethyl lead and other additives needs of refineries in Illinois, Indiana, Missouri, and parts of Michigan, Iowa, Kentucky, Tennessee and Wisconsin.

Mr. Ferris was previously an account manager in the Division's central region office which is headquartered also in Chicago. He joined the Du Pont Company in 1947 and his first assignment was at the Du Pont Petroleum Laboratory where he worked on fuel blending studies in the single cylinder engine laboratory. He then did road test work with the Du Pont fleet of fuel test cars. He was transferred to the Division's central region in 1951, where, before becoming an account manager, he was the regional automotive service representative and then sales promotion coordinator.

A graduate of Cornell University, Mr. Ferris has a B.S. degree in mechanical engineering. During World War II, he served for nearly 3 years in the U. S. Navy and held a Lieutenant, jg. commission. He is a member of the Society of Automotive Engineers.

How educators get practical industry experience at Du Pont

When a college professor tells a class of future chemists "how we used to do it at the plant," there's a good chance he's talking about the sound practical experience he picked up in industry.

The growing number of educators participating in Du Pont's summer employment program enjoy the opportunity of gaining experience and knowledge of industry which help them in their academic careers. They also supplement their incomes by summer work.

In helping educators in this direct way, Du Pont and many other industrial companies are contributing to a movement directed to the promotion of better industry-education understanding.

Du Pont broadened its summer program this year to include nearly 60 high school teachers and college professors. These men and women can draw on the experience they acquired at Du Pont plants or laboratories in 13 different states to help out with the vital job of training today's youngsters for tomorrow's jobs in industry and education.

The summer employment of college professors began just after World War II. Recently Du Pont employed high school teachers as well.

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In Canada—Du Pont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**—Ontario . . . . . HUdson 1-6461
In Other Countries—Organic Chemicals Department, Export Division, 7447 Nemours Bldg., Wilmington 98, Del., OLympia 4-5121, Ext. 2962.

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SEE DUPONT'S SHOW OF THE MONTH ON CBS

Du Pont Tetraethyl Lead and other Petroleum Additives

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

A-5709

Printed in U. S. A.

Why Lower-Groove Compression Rings Need Supplementary Pressure

Pedrick Formflex Seal-Cut
Conformable Compression Ring

The force or pressure of the compression and combustion gases back of the rings is one of the most important factors in keeping the compression rings pressing against the cylinder walls for a satisfactory seal. The tension built into the ring contributes to this, but in a relatively minor way.

The top compression ring enjoys the greatest assist from combustion-chamber pressures. The gas pressure available to the second ring is only what passes through the top-ring gap, and is substantially less than cylinder pressure. The pressure behind the 3rd ring is still further reduced. Thus, by the time the gas pressures reach the lowest compression ring usually there is not sufficient force to enable the ring to maintain a seal, and it is here that it is most important to maintain a seal to prevent the gases from going further.

The ring used in the lowest compression groove needs special assistance to do its job. This is provided in the Pedrick FORMFLEX Seal-Cut compression ring. It is a single cast-iron ring of much less radial thickness for greater conformability and response to pressures. Its special-design of overlapping ends close the gap completely. Its big assistance comes from the Pedrick "Equalizer" which backs it up and provides adequate additional outward pressure to seal at the cylinder wall and stop blowby. This pressure is exerted everywhere around the ring and is absolutely uniform.

The result is a ring conformable enough to follow cylinder-wall irregularities and with enough pressure to maintain an effective seal. Power is preserved. Contamination of the lubrication oil from blowby gases is avoided. There is no build-up of undesirable and potentially-dangerous gas pressures in the crankcase.

Why not get the full benefit of Pedrick's experience in the design and application of conformable compression, as well as conformable oil rings, to your big diesel and natural-gas engines? For engineering details on the application of conformable compression rings, write for Form 434. WILKENING MANUFACTURING CO., Philadelphia 42, Pa. In Canada: Wilkening Manufacturing Co. (Canada) Ltd., Toronto 2.

Pedrick PISTON RINGS

PEDRICK PIONEERED *Conformable* RINGS FOR BIG-BORE ENGINES

At the installation site *(above)* Polk used their new B-70 tractor for this tough hauling job. *(right)* This rigger's truck (a Mack B-80) was used for loading and unloading the 215,000-lb. compressor.

How to handle a 107½-ton Compressor!

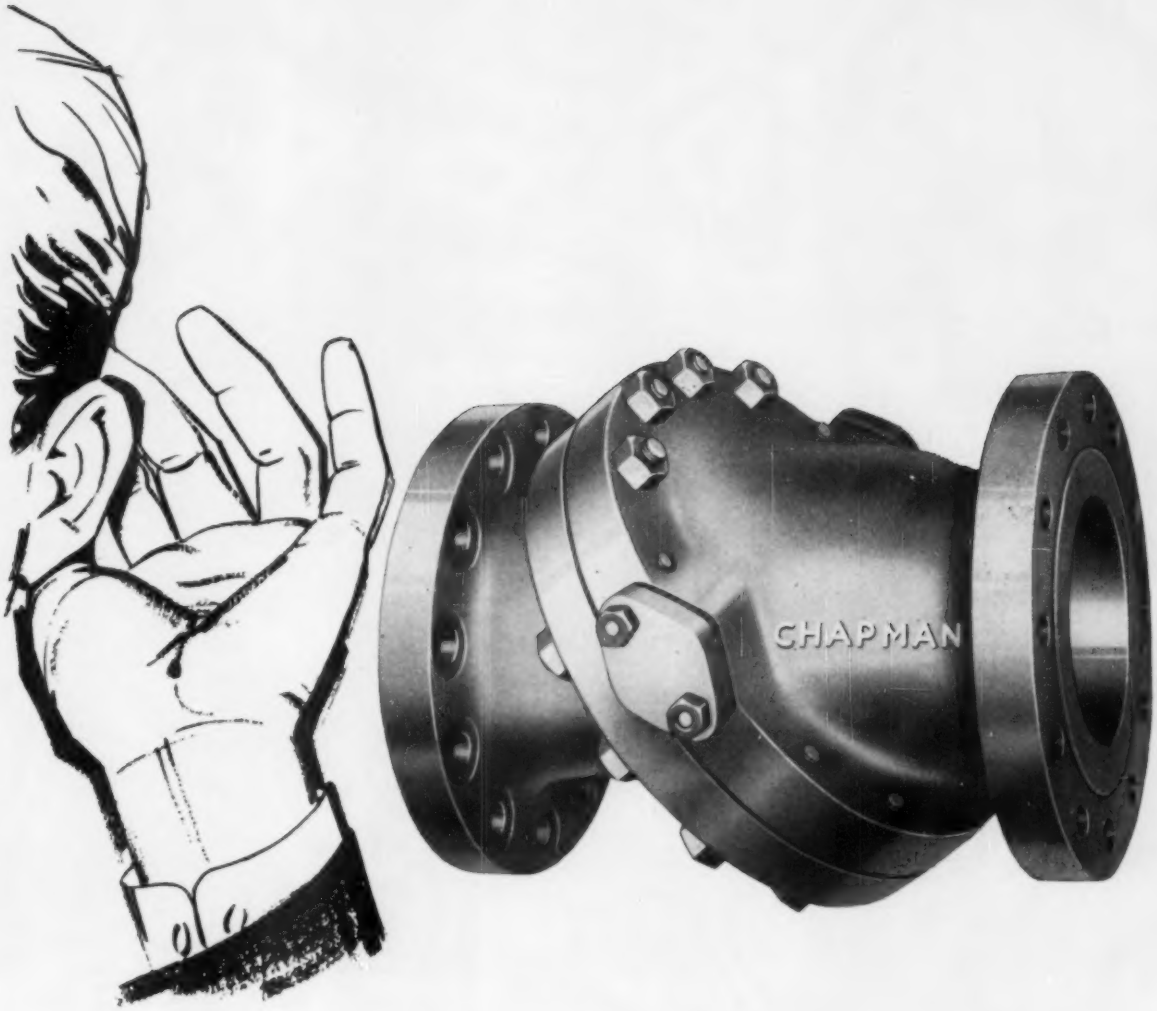
"Get yourself a couple of Macks—a tractor for pulling the low-boy and a rigger's truck for the bull work." That's the way the H. C. Polk Trucking Company of Prentiss, Mississippi, handled the moving and placement of this 215,000-lb. compressor recently installed in Greenville.

"We have been hauling in the oil fields for many years . . . long enough to know that the trucks we can really depend upon are Macks. They've got what it takes for heavy hauling over the rough terrain and through the gumbo mud we usually encounter. Their engines withstand sustained low-gear pulling and long periods of heavy winching. Mack transmissions, rear ends, and Balanced Bogies are second to none for low maintenance and long service."

This is what Mr. H. C. Polk, president of Polk Trucking, says about Macks. A Mack user for over 10 years, he's typical of the heavy oil field haulers who have found that for cost-saving, dependable operation nothing beats Mack heavy-duty trucks and tractors. They're real profit-makers! Why not let your Mack representative give you full details and specifications. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

MACK
first name for
TRUCKS

5172



With Valves . . . there's nothing like the silent treatment!

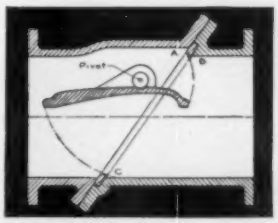
CHAPMAN Tilting Disc Check Valves

Add it all up. With Chapman Tilting Disc Check Valves you get no flutter, no vibration, no slamming or jarring or scraping of disc and seat. You get fast, sure and *quiet* operation at all times.

This is the silent treatment for valves and what it means to you is a matter of dollars and cents. You have less headaches, less trouble, less maintenance for valves and system even under severe operating conditions.

This silent treatment is an exclusive with Chapman Tilting Disc Check Valves in iron and steel . . . has been for years. These quick and quiet valves handle fluids or gases under a wide range of pressures.

You can order them for replacement or new systems. Why not, right now, check our Catalog 30-A? If you don't have a copy readily on hand, write for it today.



Here's the Inside Story

When the flow is on, "airfoil disc," supported on pivot, floats on whatever flow there is. When the flow stops, disc drops quickly, quietly and firmly on special bevel seat. You'll note that there is sufficient space around disc to cut down flow resistance.

THE CHAPMAN VALVE MANUFACTURING CO.

INDIAN ORCHARD, MASSACHUSETTS

Typical Air-Operated Instrument Panel

To keep down-time down . . .

Come to Kemp

Kemp Oriad Dryer protects compressed air operated control instruments in Seaboard Oil's Powell, Wyoming plant. Dryer, operating 24 hours a day, seven days a week requires only routine maintenance.

A Kemp gas dryer in your operation can put an end to many costly shut-downs by protecting air-operated instruments from corrosion and freezing or jamming . . . efficiently drying inert gases for purging and blanketing . . . or drying atmospheres and process gases in hundreds of other applications. Operations are faster and safer, with better quality control and frequently reduced costs.

And Kemp dryers, operating on the dynamic drying principle, are noted for dependable operation. Rugged Kemp dryers will do your drying job around the clock, month after month, without stoppages or major maintenance. Kemp design reduces utility and operating costs, uses desiccants more efficiently, and eliminates process gas contamination. Units dry to lower dew-points to give your processes and instruments highest possible protection.

Call your Kemp Representative, listed in the Chemical Engineering Catalog, for detailed information and a no-obligation survey of your dryer needs. Or write direct, for Bulletin D-100. The C. M. Kemp Mfg. Co., 405 E. Oliver St., Baltimore 2, Md.

Kemp Convection Dryers

Kemp Inert Gas Generators

KEMP OF BALTIMORE

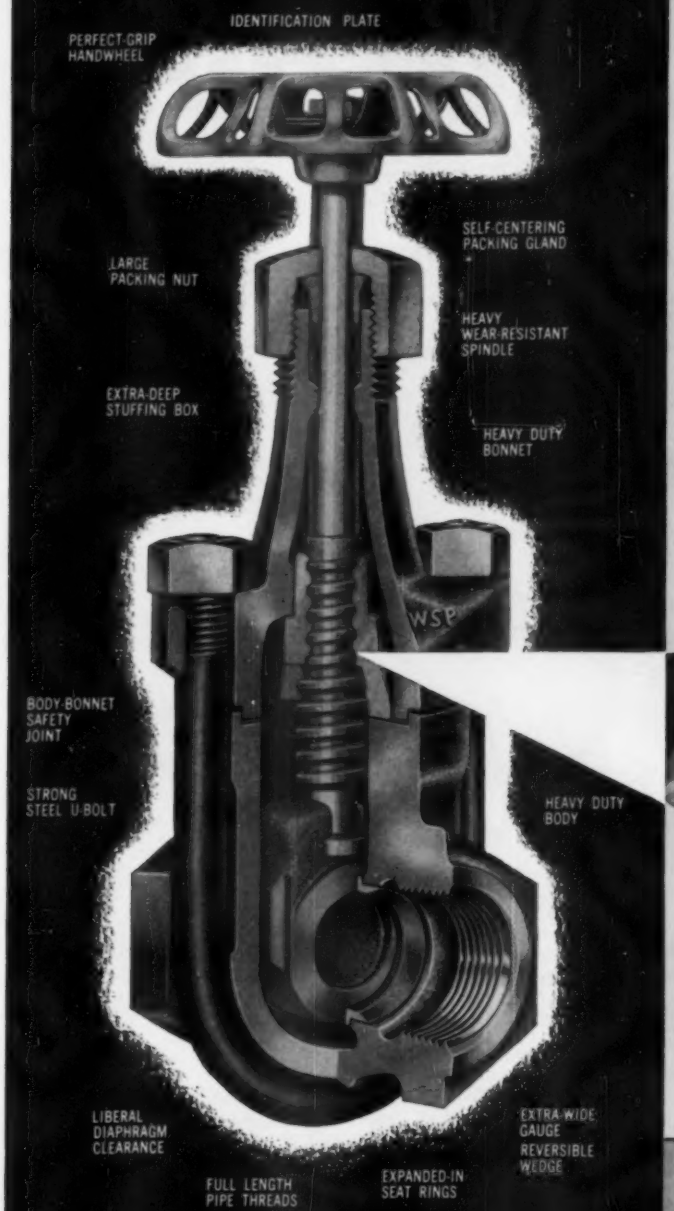
Kemp Industrial Carburetors

Kemp Oriad Dryers

Only the big line of

JENKINS U-BOLT GATES

has all these dollar-saving features



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Inside Screw and O.S.&Y., patterns . . . Iron Body with Bronze or Stainless Steel Mounting, All Iron, Ni-Resist with Type 316 Stainless Steel trim. GET FOLDER NO. 207 about the complete line. Ask your local Jenkins Distributor, or write Jenkins Bros., 100 Park Avenue, New York 17.

Priced no higher

DESIGNED TO COST LESS TO USE

Built right into a Jenkins U-Bolt Gate Valve are dollar-saving features no other can match. Construction superiorities that equip this valve to take punishment longer . . . saving dollars in replacement bills. Features that cut maintenance time and the cost of replacement parts . . . saving more dollars. For a good example, look at the unique Renewable Bonnet Saver Bushing which is a patented feature of Inside Screw valves.

BONNET-SAVER BUSHING

No need to junk a bonnet with worn operating threads. Just slip in a new bushing for good-as-new thread engagement . . . saving bonnet and lengthening spindle life.

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

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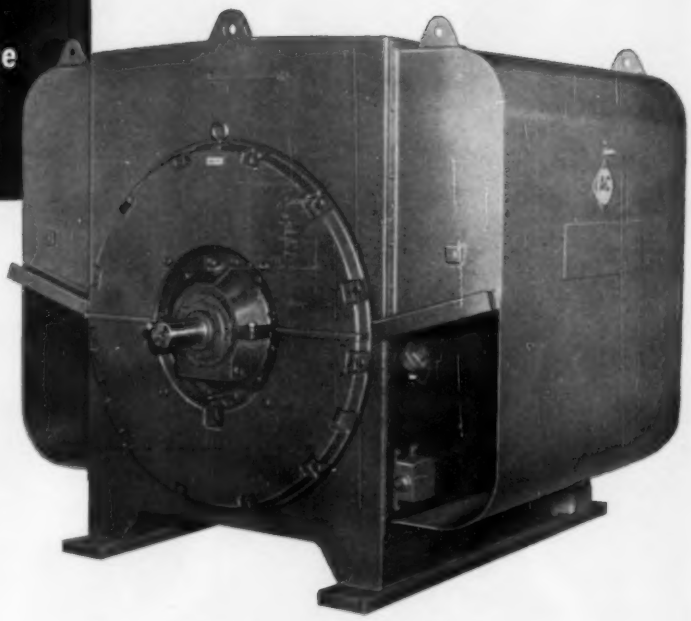
Sold Through Leading Distributors Everywhere

Eliminate costly enclosures with Allis-Chalmers weather-protected MOTORS

Modern features
cut operating, maintenance expense . . . give MORE dependability



Here's a newly designed line of Allis-Chalmers weather-protected motors with the ability to "take" outdoor conditions. This means no expensive protective enclosures are needed . . . a big saving in plant or installation building costs.

Designed to meet defined NEMA requirements, these motors incorporate many important features which assure dependable outdoor operation:

- **Ventilating System** — Low velocity intake, vertical lift, change of direction and high velocity discharge of ventilating air keep rain, snow, sleet, dust and dirt out of vital parts.
- **Removable Air Ducts** — To facilitate inspection and maintenance of interior air passages, air intake ducts are designed for quick removal.
- **Stator Assembly** — Removable as a unit, it simplifies maintenance and minimizes downtime.
- **Split Sleeve Bearings** — Capsulized design permits access to motor interior without disturbing the bearings or their enclosures. Positive vapor seal is used on high-speed motors. Antifriction bearings are available for slow speed motors.
- **Proven Insulation** — Famous Allis-Chalmers insulation systems (Class A and B) are available. And, for extreme temperatures, or where high resistance to abrasion and moisture is required, Allis-Chalmers can provide the revolutionary *Silco-Flex* system.

Silco-Flex is an Allis-Chalmers trademark.

THIS DESIGN available in ratings from 250 to 900 hp. Other designs in larger horsepower ratings are also available. Contact your A-C sales office or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. Ask for Bulletins 51B8606A and 05B7894.

A-5292

ALLIS-CHALMERS

Prove on Your Job that the Sherman Digs Faster to Save You Money

The recently introduced Model "F" Sherman Power Digger excavates faster than any comparable backhoe!

Hard to believe? Well, don't take our word for it. We challenge you to "Clock it"! Ask your Ford Tractor Dealer to demonstrate the new Sherman on *your* job while you time it with a stopwatch. Prove to yourself that it saves you money by producing more work per dollar invested in time, equipment, maintenance and manpower.

If you are interested, we'll be glad to tell you of the many revolutionary features which contribute to the digging speed and durability of the new Model "F". Just drop us a line for Bulletin No. 1570.

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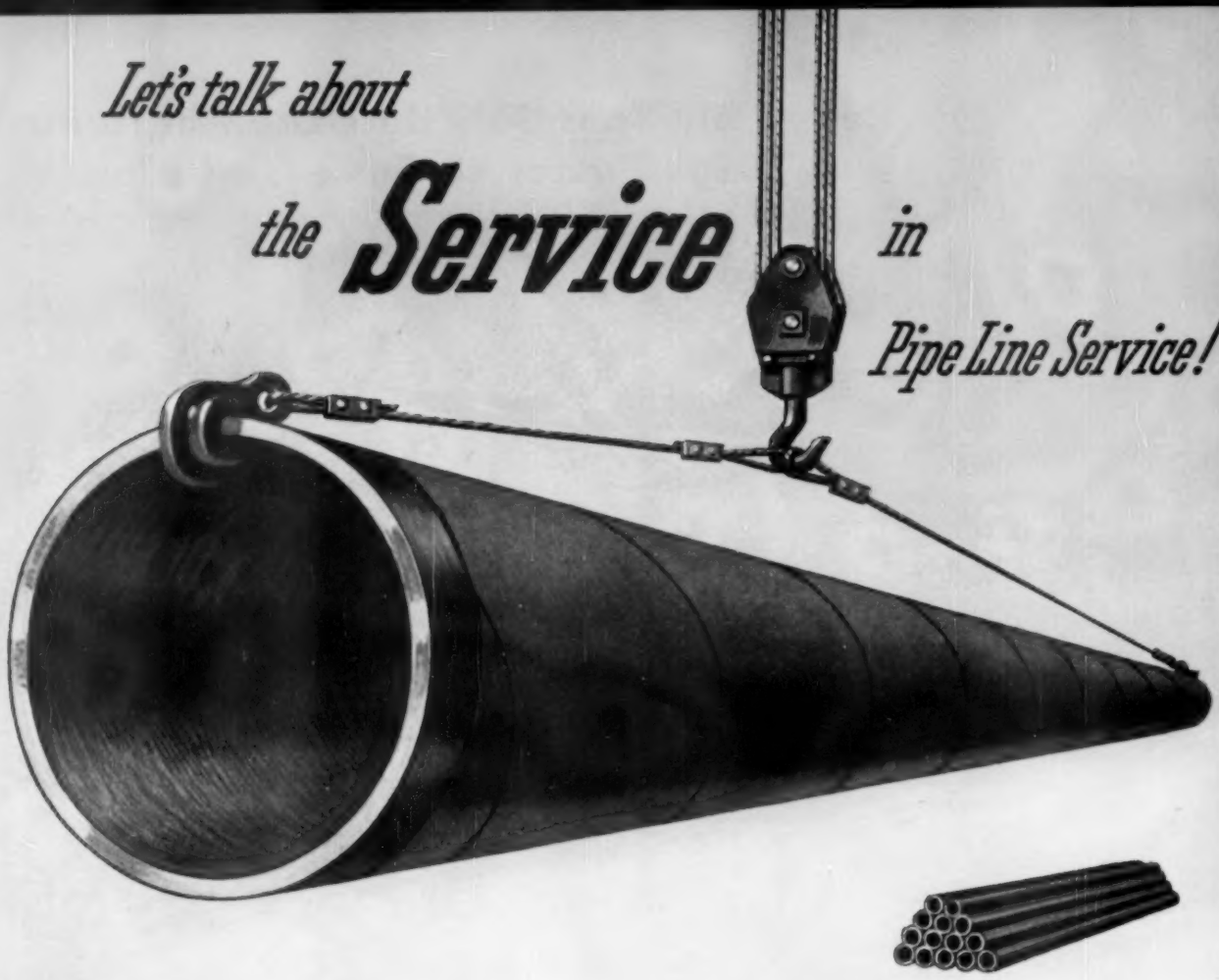
PRODUCTS, INC.
ROYAL OAK, MICHIGAN
POWER DIGGERS • FRONT END LOADERS • FORK LIFTS

Let's talk about the **Service** *in Pipe Line Service!*



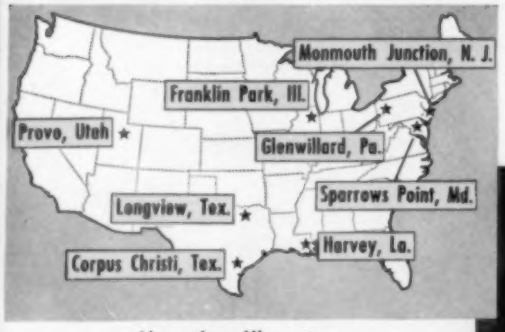
A company doesn't become a leader through quality of product alone. Although Pipe Line Service through the years has proved consistently that quality depends on coating and wrapping under controlled plant conditions, *service* is half the battle.

By service, we mean storing your pipe *at no cost to you* . . . plants strategically located near your sources of supply . . . and large storage facilities to allow you to purchase pipe when delivery is most favorable. Your pipe will be held in storage until needed—and then coated under the PLS high standards of uniformity. You *always* get a freshly applied coating job at the time pipe is ready to be laid. And PLS will ship your protected pipe *where* you want it . . . *when* you want it!

All this, *plus* the service of a PLS representative when needed. It's his job to help you in the proper handling, storage and laying of PLS protected pipe, to give you the maximum return on your investment.

This combination of quality *and* service assures you of the finest in pipe protection. On your next coating job call in your nearest PLS representative—you'll find that he can save you time, trouble and money.

There's a PLS plant strategically located to serve YOU!



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Pipe Line Service Corporation

FRANKLIN PARK, ILLINOIS

Quality pioneers in coating and wrapping pipe for a quarter century

They Say—

Circling the issue offshore

"There are lots of angles to the great offshore oil dispute . . . But there is no doubt whatsoever that the case is back where it was 7 years ago, and that neither the federal Government nor the states nor the oil companies concerned yet know where they are. And no end is in sight.

"In its complaint (in November) the federal Government did seem to show the beginning of a sneaking suspicion that the whole thing is getting faintly ridiculous. It observed 'there is urgent need for prompt and final settlement of the controversy.'

"Most people can say 'amen' to that. It might also have helped speed a final settlement if the federal Government had kept its position from going in circles."

Editorial in the Wall Street Journal.

Why don't cost indexes jibe?

Dear Sir:

In using the indexes for heat exchangers published in The Oil and Gas Journal, we have noticed that the figures for 1954 and 1956 as tabulated in the quarterly itemized cost indexes differ from the corresponding figures in the monthly Refinery Construction Index box as follows:

	Monthly	Quarterly
1954	171.7	174.5
1956	190.7	193.4

Further, a graph of heat exchanger indexes on page 133 of the October 28, 1957, issue indicates about 169 for 1954, while agreeing with the monthly figure for 1956. May we have your comments on the above?

We have been finding the itemized indexes very useful in our cost estimating work. The indexes cover most of the materials used in the construction of petroleum refineries. We would like to know, however, if you have any information on the following classes of material, which do not appear to be adequately covered.

1. **Insulation.** We note that you have dropped the BLS index, presumably because of its inapplicability to petroleum refineries.

2. **Boilers.** We understood that at least one boiler manufacturer keeps an index for his own purposes.

3. **Process furnaces.** We have been using a composite index made up of the following components, but we

Campbell Chain

GOES BIG WITH ANY RIG!

"Measure-Mark" Chain

CAM-ALLOY and CAMPBELL HIGH TEST STEEL

Exactly marked every 5'. Color-coded for instant grade identification. Standard footage in every pack—color-coded labels with inventory control. **Cam-Alloy** features *extremely* high tensile strength—excellent resistance to wear—light weight for given load. Look for the *orange* "Measure-Mark." Campbell **High Test** Steel Chain is high-carbon steel, heat-treated for high tensile strength and maximum resistance to abrasion. Short links give maximum flexibility. Look for the *blue* "Measure-Mark."

BOOMER CHAINS

Made from Cam-Alloy or High Test Steel Chain with Grab Hook each end, 20 feet long. Supplied bright finish. Packed one chain in cloth bag. In dimensions and weights for every job.

WINCH LINE CHAINS

Made from High Test Steel Chain, heat-treated for increased resistance to wear and shock loads. Tagged for size and length. Bright finish. In dimensions and weights for every job.

TRUCK TIRE CHAINS

Available in 3 grades: *Lug-Reinforced* for maximum traction and wear, *Mud-Service* for off-the-road use, *Highway Service* for general use . . . single pneumatic and dual triple.

CAMPBELL CHAIN CAMPBELL CHAIN *Company*

***Factories and Offices:* York, Pa.—W. Burlington, Iowa**

WAREHOUSES: Campbell Chain Company, 712 "R" St., P.O. Box #1144, Sacramento, Calif.; 3085 N.W. Front St., Portland 10, Oregon; Wald Terminal Warehouse, 902 Live Oak, Houston, Texas.

WEST COAST SALES MANAGER: D. R. Coutts, 1933 Mission Ridge Road, Box 1175, Santa Barbara, Cal.

TERRITORY MANAGERS: J. N. Kuhl, 7000 S. Shore Drive Hotel, Chicago, Ill.; S. Hardison, 1970 Val Verde, Germantown, Tennessee; S. Adsit, 17 E. 57th St., Kansas City, Mo.; A. E. Vincent, 3917 Thaxton Ave., S.E., Albuquerque, N. Mex.; K. Steinmetz, 1339 Sherwood Road, Glenview, Ill.; D. A. Ruffin, 5623 Boaz St.—Apt. #90, Dallas 9, Texas; G. W. Ferree, 5634 Putnam Drive, Birmingham, Mich.

CONTACT ANY OF THE CAMPBELL REPRESENTATIVES ABOVE FOR COMPLETE INFORMATION ON *ANY* TYPE OF CHAIN—OR HELP WITH A PARTICULAR CHAIN PROBLEM.

The welcome mat is always out at your **UNITED SUPPLY** store

Any time, day or night, your UNITED SUPPLY store folks will welcome your call or visit. And no drilling rig or producing lease is out of reach of FAST UNITED delivery. So use the UNITED SUPPLY welcome mat . . . get the dependable parts, service or equipment you need, when you need them . . . contact the courteous people at your nearest UNITED store, 22 locations in 5 states . . . they're your supply friends.

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have been unable to check its accuracy.

Index component	Code No.	Fraction
Finished steel	10-14	0.6
Castings	10-15	0.2
Brick-fireclay	13-42	0.2

4. **Columns and pressure vessels.** We have been using the boilers, tanks, and sheet-metal index, code number 10-72, but we are concerned about its applicability. The steel-plate index, code number 10-14-26, does not seem quite right either. The answer may possibly lie somewhere between the two.

Any assistance or advice you may be able to give will be greatly appreciated.

W. E. Tucker,
Technical Services Division,
Caltex Service Co.,
New York.

COST-imating author replies

Dear Mr. Tucker:

We appreciate your letter and the discrepancy disclosed therein. Needless to say, we were dismayed to hear of the discrepancy. The basic indexes are those published each month and accordingly the correct indexes are:

	Exchangers		
Year—	Copper base	Steel	Composite
1952	175.3	152.3	165.8
1953	185.3	159.4	174.9
1954	190.7	156.8	171.7
1955	164.3	145.3	156.8
1956	198.8	178.6	190.7
1957 (11 mo.)	190.4	213.8	203.6

We are always searching for new or more representative indexes, but trouble has arisen with the very same indexes as those you mention, especially for insulation, heavy-plate steel, castings, and various alloy steels. We have considered the obtainment of such prices from suppliers, but more work is involved than one might expect.

With respect to your specific questions:

1. The insulation index of BLS was abandoned because it did not represent our types of material.

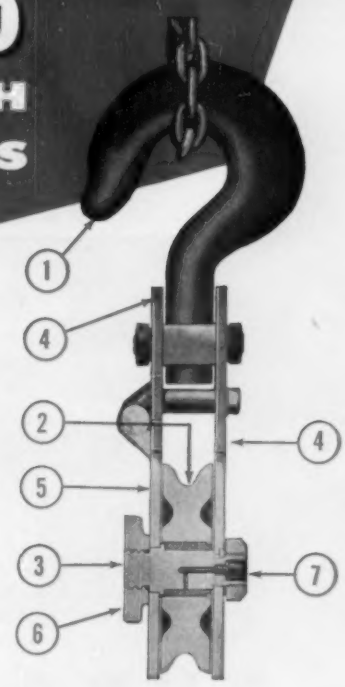
2. We have not been able to locate a boiler index. However, Marshall-Stevens, Inc., of Chicago (see indexes in Chemical Engineering) publishes an index for steam-power plant equipment (no labor).

3. COST-imating No. 12, May 21, 1956, showed a pipestill index. Originally we considered:

	Per cent
Tubes	30
Headers	20
Supports	10
Steel	17
Brick and tile	23

Entirely adequate indexes were not

THE Inside Story of WECO SNATCH BLOCKS



These design and construction features are the reasons for the outstanding performance, easy handling, long life and dependability you'll get from WECO Snatch Blocks in a multitude of services.

1. Drop-forged, heat-treated hook has 100,000 lb. capacity.
2. Forged steel sheave is precision machined and accurately gaged, assuring longer life for sheave and rope.
3. Extra heavy sheave pin has "Super Oilite" bearing for smooth-running strength.
4. ⅜" steel plate resists distortion.
5. Drop-Side (patented) is hinged for easier handling and stringing.
6. Wing nut, tightened or loosened with hammer, holds drop-side in place.
7. Zerk fitting for sheave pin lubrication.

25-ton working load capacity; available in 6", 8" or 10" sizes.

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

fmc

YUBA ENGINEERED HEAT EXCHANGERS

Complete facilities for the production of the finest heat exchangers are at your service at Yuba. With branch offices and representatives at every principal point throughout the country, Yuba is able to have a sales-engineer at your desk in a matter of hours to help you start your heat exchanger project.

At three of Yuba's plants at Honesdale, Pa., Buffalo, N. Y., and Richmond, Calif., are top heat exchanger engineers with national reputations for their progressive designs. Daily they design all types of heat exchangers, large or small, simple or complex... heat exchangers which operate at vacuum or to pressures of 5000 psi, at temperatures below zero or to 1000 F and higher . . . heat exchangers made of all kinds of metals: carbon steel, alloy steel, aluminum, nickel, and non-ferrous alloys such as the new silicon bronzes... heat exchangers with bundles having a few tubes or as many as 7500, with heat transfer surfaces up to 15,000 and 20,000 sq. ft.

Yuba is experienced... some of its divisions having made heat exchangers for as long as 50 years. Yuba has outstanding techniques... many of its heat exchangers having been "firsts" in their fields. Yuba is nationally recognized... in the chemical, oil, gas, power, mechanical and heating industries.

Buy Yuba. Its plants in both the East and the West mean convenience for you, speedy delivery, service . . . but, above all, well-engineered heat exchangers tailor-made for your own process.

YUBA

Divisions Manufacturing Heat Exchangers

YUBA HEAT TRANSFER DIVISION, HONESDALE, PA.
CALIFORNIA STEEL PRODUCTS DIVISION, RICHMOND, CALIF.
ADSCO DIVISION, BUFFALO, N. Y.

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available, so this was used as a compromise:

	Per cent
Boiler tubes	24
Structural steel	26
Valves and fittings	12
Fire brick	18
Labor	20

This is nearly the same as you proposed.

4. Our feeling is that code 10-72 is probably not representative because constant changes in design may keep costs from rising, and that code 10-14-26 better represents the large installations of our industry.

Whenever the indexes discussed above become readily available, they will be included on the quarterly itemized index page.

W. L. Nelson
Technical Editor
The Oil and Gas Journal.

Tomorrow's gasoline makeup

"By 1932 we had gone about as far as thermal cracking would carry us, and progress slowed. However, in 1936 the age of commercial catalytic processes began with construction of the first catalytic crackers and polymerization units.

"Due to the Second World War and the need for the high-octane synthetic molecules in aviation gasoline, the full effect of catalytic procedure did not appear until 1945. Once again, our progress shot up as heavy naphtha catalytic reforming plants were built and as alkylate, previously reserved for aviation gasoline, was blended into motor gasoline.

"Today our gasoline is made up of approximately 80 per cent cat cracked, reformed, and synthesized molecules. On the horizon for the future we see light naphtha catalytic isomerization raising the percentage to near 90."

Elliott B. McConnell, vice president of manufacturing, Standard Oil Co. (Ohio), in an article in the October issue of the "Sohioan," company magazine.

A growing competitor

"The gas industry is facing a severe competitive situation. It is going to get worse. The electric utilities already are cutting into our cooking and water-heating business.

"Through development and sale of the electric heat pump, they can take a large share of the summer-cooling business and along with it the winter heating unless we take steps to prevent it."

J. C. Hamilton, president, Arkansas Louisiana Gas Co., in a speech to the American Gas Association.

GRACE CHEMICAL REPORTS:
A TON AND A HALF OF PRESSURE AT 400° DOESN'T FAZE THESE Hamer PLUG VALVES
Rugged 24-hour a day use—3000 psi at 400°F. A plug valve has to be tough to take it—especially since failure of one valve could cost Grace Chemical up to one-third of their ammonia production at their Memphis plant. Grace Chemical's choice—18 Hamer Lift-Type Gear-Operated Plug Valves. Results since installation—Not one minute of downtime or valve difficulty despite the fact that pressures exerted on these Hamer Valves are higher than the pressures exerted on any other valve in the ammonia plant system.
There's a good reason for the unusual excellent performance of these and other Hamer Plug Valves, and that reason is simply top quality design, material and craftsman-like manufacturing methods. Investigate Hamer plug valves for your tough application. Let a Hamer representative show you how these valves can actually pay for themselves.
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Representatives throughout the world.
VALVES INC
Hamer Lift-action Plug Valves can't stick. Exclusive plug adjusting nut makes it easy to open or close the valve no matter what the service condition.
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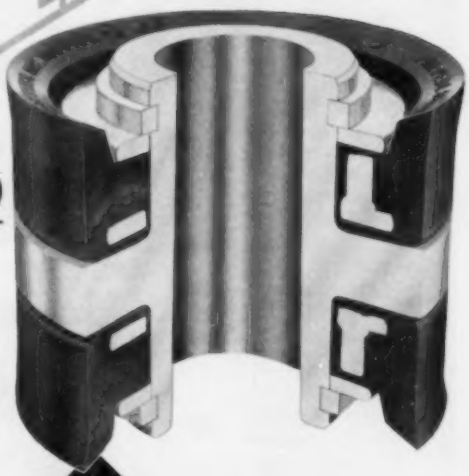

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CALENDAR

DECEMBER

10-11 University of Oklahoma, second annual conference on water quality control for subsurface injection, sponsored by the School of Petroleum Engineering, Extension Study Center, Norman, Okla.

JANUARY

11-12 National Oil Scouts and Landmen's Association, directors' meeting, Adolphus Hotel, Dallas.

16-18 Association of Oilwell Servicing Contractors, second annual convention, Baker Hotel, Dallas.

19-22 Pipe Line Contractors Association, tenth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

31 Natural Gasoline Association of America, regional meeting, Skirvin Hotel, Oklahoma City.

FEBRUARY

12-14 National Association of Corrosion Engineers, Tulsa section, ninth annual corrosion short course for pipeliners, Mayo Hotel, Tulsa.

13-15 National Society of Professional Engineers, spring meeting, Michigan State University, East Lansing, Mich.

16-20 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Hotel Statler, New York.

26-28 American Petroleum Institute, Division of Production, southern district meeting, Shamrock-Hilton Hotel, Houston.

28 Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

3-4 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fourth annual joint meeting of Rocky Mountain petroleum sections, Cosmopolitan Hotel, Denver.

5-6 Gas Conditioning conference, sponsored by the University of Oklahoma, Oklahoma Memorial Union Building, Norman, Okla.

7 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

10-13 American Association of Petroleum Geologists and Society of Economic Paleontologists and Mineralogists, forty-third annual meeting, Biltmore Hotel, Los Angeles.

12-14 American Petroleum Institute, Division of Production, southwestern district meeting, Hotel Texas, Fort Worth.

17-21 International Atomic Exposition, Inc., 1958 Nuclear Congress, Chicago Amphitheatre, Chicago.

17-21 National Association of Corrosion Engineers, annual conference, civic auditorium, San Francisco.

20-21 New England Gas Association, annual meeting Hotel Statler, Boston.

20-21 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, regional conference on production and reservoir engineering, Mayo Hotel, Tulsa.

24-26 Midwest Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

31-April 2 American Petroleum Institute, Division of Transportation, annual pipeline conference, Jung Hotel, New Orleans.

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is to call General Geophysical Company — they have
been putting the percentage for successful exploration in the
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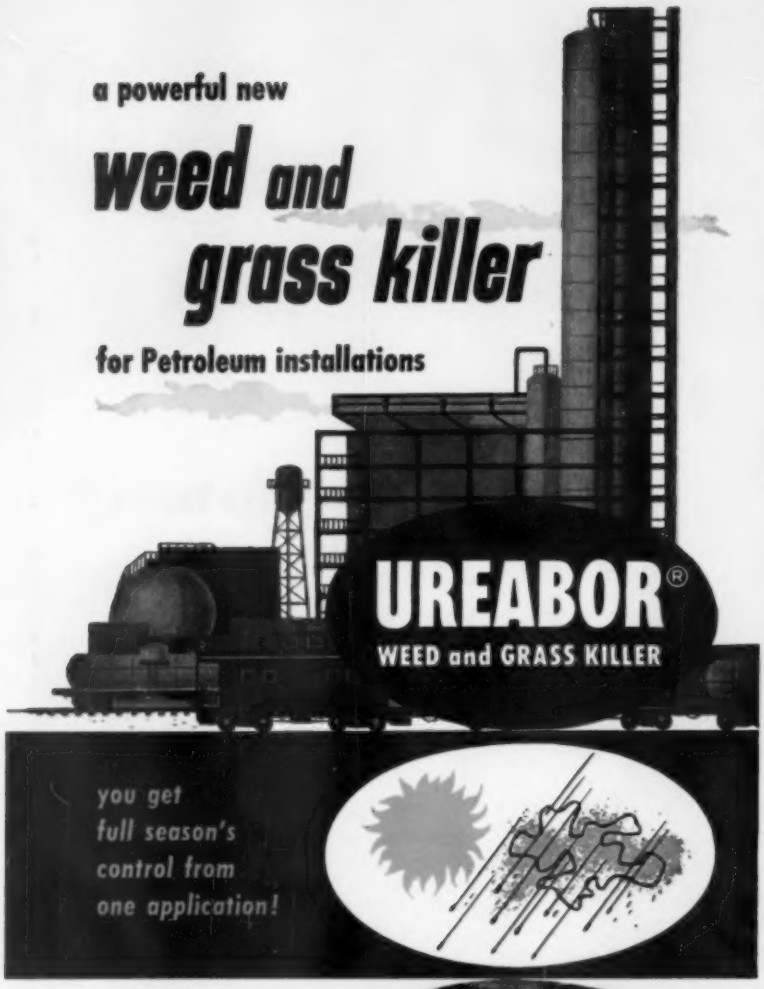

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APRIL

1-3 University of Oklahoma, fifth annual conference on corrosion control, Extension Study Center, Norman, Okla.

9-11 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Biltmore Hotel, Oklahoma City.

13-18 American Chemical Society, national meeting, San Francisco.

15-17 University of Oklahoma, thirty-fourth annual gas measurement short course, North Campus, Norman, Okla.

16-18 Natural Gasoline Association of America, annual convention, Baker and Adolphus Hotels, Dallas.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Louisiana-Arkansas, East Texas, and Mississippi petroleum sections, gas technology symposium, Shreveport, La.

20-23 American Institute of Chemical Engineers and Chemical Institute of Canada, chemical engineering division; Canada-U.S. chemical engineering conference, Montreal.

21-23 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Cosmopolitan Hotel, Denver.

27-29 Independent Petroleum Association of America, midyear meeting, Hotel Sherman, Chicago.

27-30 American Association of Petroleum Geologists, Rocky Mountain section, Casper, Wyo.

28-29 University of Oklahoma, third annual conference on automatic control in the petroleum and chemical industries, Oklahoma Memorial Union Building, Norman, Okla.

28-30 Southern Gas Association, annual convention, Dallas.

MAY

5-6 Society of Petroleum Engineers of A.I.M.E., North Texas section, secondary-recovery symposium, Wichita Falls, Tex.

5-7 Purdue University, thirteenth annual industrial waste conference, Purdue Memorial Union Building, Lafayette, Ind.

5-9 American Gas Association, distribution, production, and transmission conference, Roosevelt and Commodore Hotels, New York.

7-9 American Petroleum Institute, Division of Production, eastern district meeting, Deshler-Hilton Hotel, Columbus, Ohio.

12-14 Chemical Institute of Canada, National Research Council, eighth Canadian high polymer forum, Macdonald College, St. Anne de Bellevue, Quebec.

12-16 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, Los Angeles.

20-22 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

21-23 American Petroleum Institute, Division of Marketing, midyear meeting, Roosevelt Hotel, New Orleans.

22-23 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

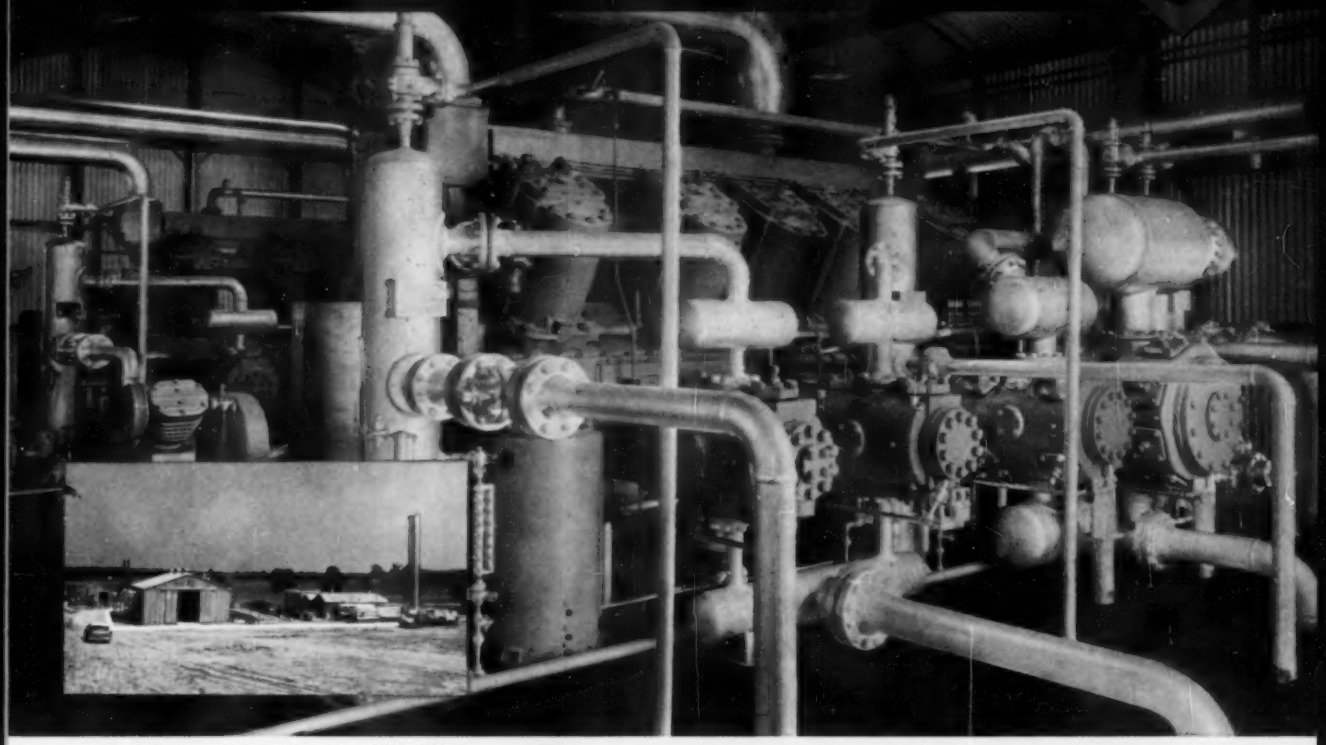
26-28 Chemical Institute of Canada, annual conference and exhibition, Royal York Hotel, Toronto.

JUNE

8-11 American Petroleum Institute, Division of Transportation, annual tanker conference, Greenbrier Hotel, White Sulphur Springs, W. Va.

19 Pennsylvania Grade Crude Oil Association, annual meeting, Penhills Club, Bradford, Pa.

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



Tatum Gas Plant equipped with two Beaird-Ingersoll-Rand 10SVG 550 h.p. packaged compressors. Units are complete with all necessary controls for unattended operation. Other sizes from 120 to 660 h.p.

Packaged Compressor Equipped . . .

GAS PROCESSING BOOSTS FIELD ALLOWABLES

Robert Cargill, operates this gas processing plant in the Tatum-Petit Field. Located just outside the city limits of Tatum, Texas, the field has grown from a single wildcat to 75 producing wells in less than three years. During this swift expansion it became evident that the increasing number of high gas-oil ratio wells would curtail oil production unless a means was provided to conserve the excess gas. An additional problem was created by the wide variation of wellhead pressures which ranged from 25 psig. to 650 psig.

Engineers called in by Robert Cargill solved the production problem by designing a gas processing plant to remove heavy elements as marketable by-products and to boost the dry gas to a nearby sales line. Two Beaird-Ingersoll-Rand 10SVG 550 horsepower packaged compressors were selected for the main station. Each compressor has been engineered to handle both low and high pressure streams. Low pressure gas is boosted through three compression stages then tied into the discharge of the fourth cylinder which boosts the high pressure stream. The plant can process 20 mmcfd. at 850 to 1,000 psig. discharge with its present arrangement.

As future requirements demand, additional packaged units may be economically installed to handle the increased load. When the field is depleted the compressors may be moved to other service with little or no change in piping or manifolding.

Let us assist you in planning an economical solution to your production problem. Call or write . . .

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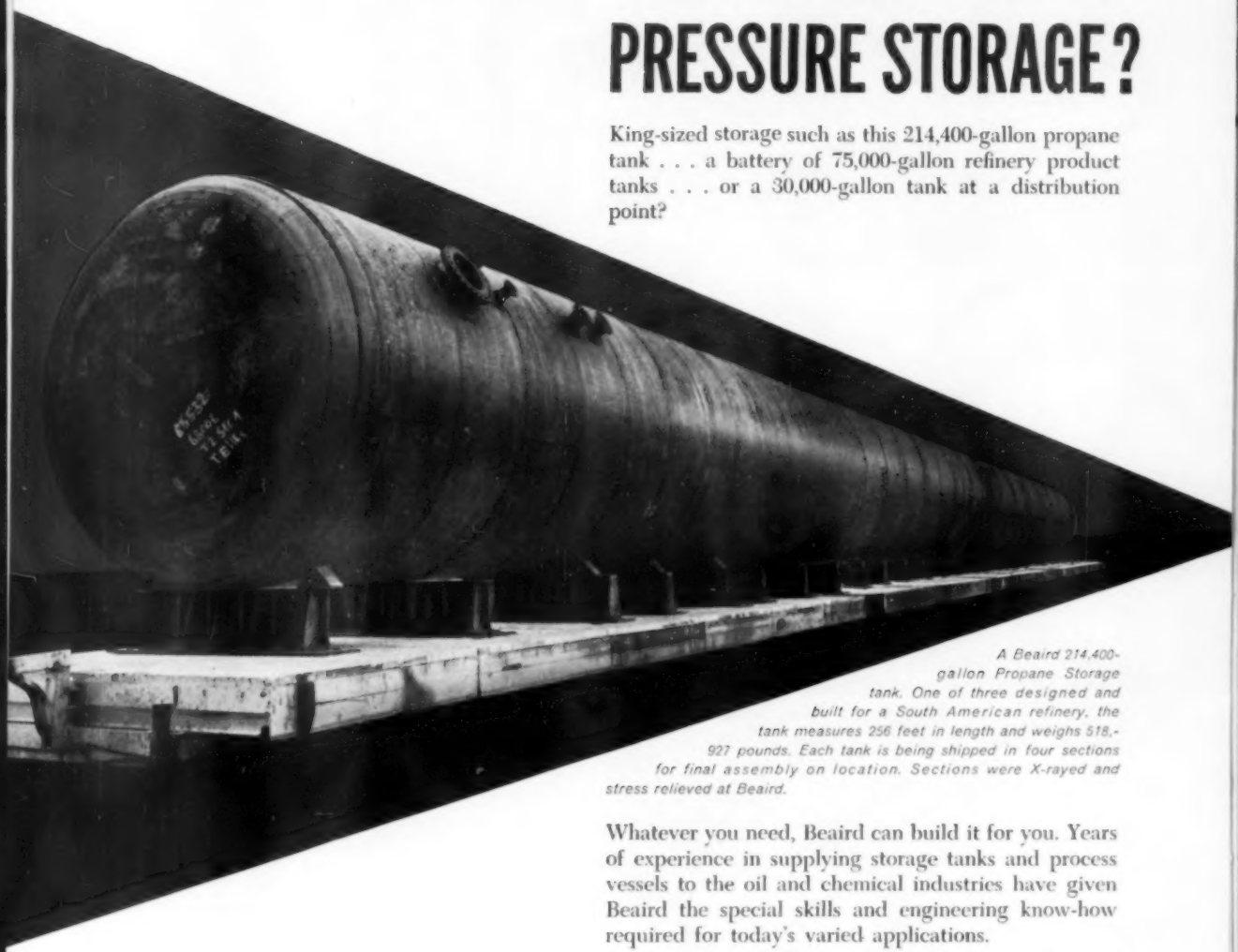

A Beaird 214,400-gallon Propane Storage tank. One of three designed and built for a South American refinery, the tank measures 256 feet in length and weighs 518,927 pounds. Each tank is being shipped in four sections for final assembly on location. Sections were X-rayed and stress relieved at Beaird.

Whatever you need, Beaird can build it for you. Years of experience in supplying storage tanks and process vessels to the oil and chemical industries have given Beaird the special skills and engineering know-how required for today's varied applications.

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When your next project is in the idea stage, call in a Beaird sales engineer. His specialized knowledge can help you obtain maximum storage at lowest possible cost.

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the OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING

Small Oil Man

BIG OIL companies overshadow little operators in the minds of many people, and in the same way the API reports in our November 18 issue may have overshadowed a special article on the place of small business in oil (pages 256 to 268).

But one lease broker down in South Texas who would like to be a big oil producer, read it with such interest that he was moved to write:

"How small is 'small'? I have been reading your article and still don't think you have got down to the minuteness of 'small'—that is, the lease broker.

"I started small and am still small.

"I don't know what place my history has in The Oil and Gas Journal. I guess it must of necessity be a biography—privately financed. Some day when I get steamed up I may write it.

"Starting out with $1,000, which I saved from my former work during the First World War, I built it up after about 38 years to about $1,000—maybe a little better. A farm or two bought for the mineral gamble—which is still a gamble—and a few mineral or royalty interests that pay from 1 cent a month to as much as $20 a month, cost me $1,000 total.

"Maybe some day I will get my money back.

"Anyway, I want to tell you about the time I forded the Red River opposite Headrick, Okla.,—six mules pulling me in a borrowed Chevrolet, with the battery on the front seat.

"And of my experience with the bent front axle and bowlegged, fluttering front wheels in Watters, Tex., which threatened to use up my entire capital before I could get rid of the town.

"And about my getting stuck in the sandy road at the turn of the main street in Seminole.

"And so on.

"I guess the only thing I can be proud of is that I have gone through the oil business—if you can call it that—and still retain my $1,000."

Well, Mac, maybe you're lucky to have spent 38 years trying to become an oil producer and wind up with your original capital and a royalty of $20 a month. A lot of people haven't done that well.

Another thing you can be proud of, Mac, is that you still retain your sense of humor. A fellow sure needs a sense of humor in the oil business.

And when you are sitting in the poorhouse, living off that $20 a month and writing your memoirs, what a wealth of rich experiences you will have to draw on. You perhaps have acquired more than you realize for having "gone through the oil business"—and we do call it that, because your experience can be duplicated a thousand times.

Mac, we hope you do get steamed up to write your autobiography some day. Your history may have no place in The Oil and Gas Journal—we're strictly a forward-looking magazine, you understand. And you may have to have its publication privately financed, because we can warn you from personal experience that writing is no sure way to get rich, either.

But your story and thousands more like it should be published because too many people think that the oil business is nothing but a gravy train. For years we've been looking for statistics to prove our belief that more money has been lost in the oil business than has been made from it. It's time somebody compiled them.

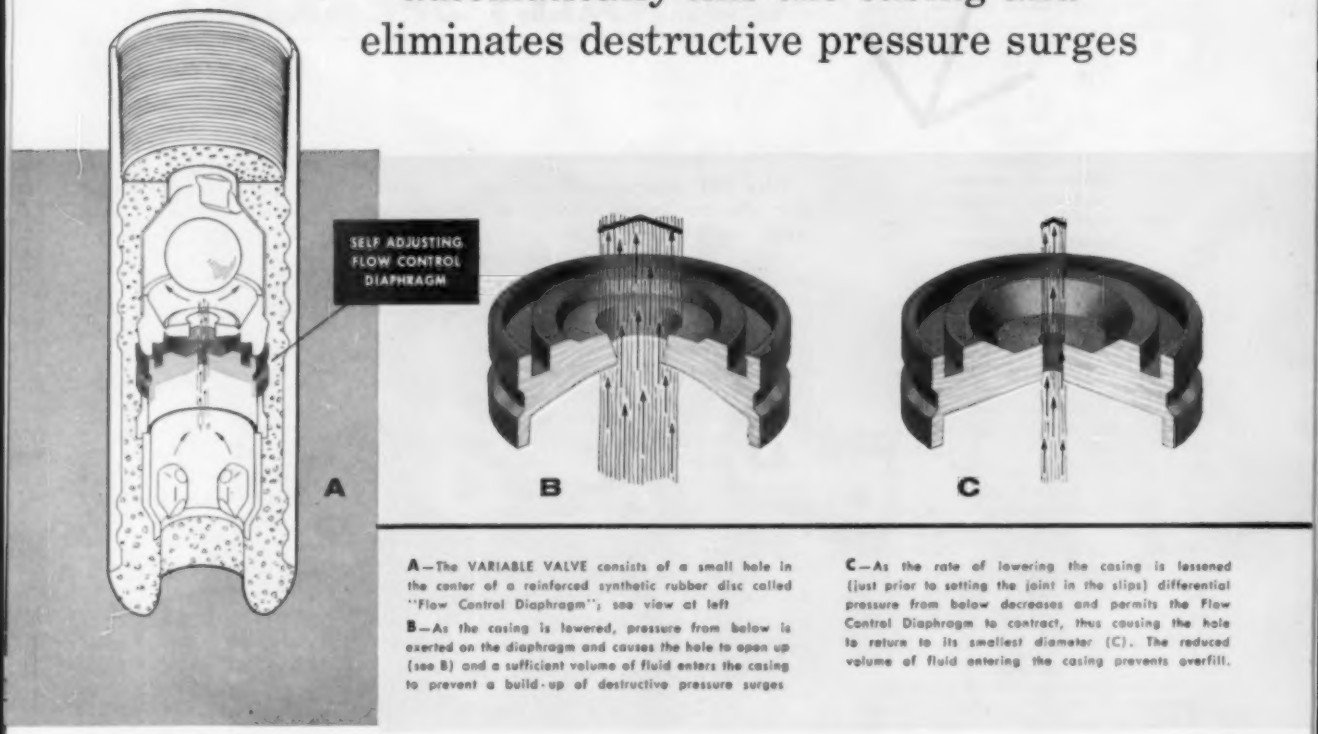
To answer your question "how small is 'small'?", well, Mac, you aren't small—you're minuscule. But every one of the big boys started the same way you did. Only the ball bounced their direction. We can see you aren't bitter about it.

And of course you realize that it takes the sum total of small, tiny, and minuscule risk takers to find oil, and that the oil business wouldn't be the oil business without thousands of guys like you. That was the point of our article.

—Henry D. Ralph.

See for yourself...

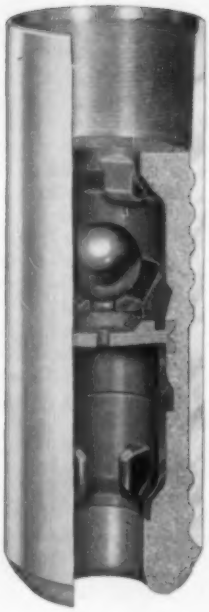
how the variable valve in FLEXIFLOW Shoes and Collars automatically fills the casing and eliminates destructive pressure surges



A—The VARIABLE VALVE consists of a small hole in the center of a reinforced synthetic rubber disc called "Flow Control Diaphragm"; see view at left

B—As the casing is lowered, pressure from below is exerted on the diaphragm and causes the hole to open up (see B) and a sufficient volume of fluid enters the casing to prevent a build-up of destructive pressure surges

C—As the rate of lowering the casing is lessened (just prior to setting the joint in the slips) differential pressure from below decreases and permits the Flow Control Diaphragm to contract, thus causing the hole to return to its smallest diameter (C). The reduced volume of fluid entering the casing prevents overfill.



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Product No. 160

When casing equipped with FLEXIFLOW Shoes or Collars is lowered in the well, increase in pressure from below causes the variable valve to open up wider to relieve pressure from below by permitting a large volume of fluid to enter the casing. When downward movement of the casing is slowed down, pressure from below is reduced and the hole in the diaphragm contracts to restrict the fluid entry and prevent overfilling. This action of the variable valve in opening wider and closing down, synchronizes the rate of fill of the casing with the rate of lowering the casing, *and in so doing provides maximum relief from pressure surges.*

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BAKER FLEXIFLOW

IOCC throws more heat than light on imports

IN the long running controversy over imports of foreign oil, one of the arguments for limitation has always been the effect on conservation of domestic petroleum resources.

And like most of the arguments in this controversy, the conservation aspect has frequently been overstated, understated, misstated or contorted by one or another of the protagonists.

In an ostensible effort to present the facts, the Interstate Oil Compact Commission has just issued a lengthy report on the effects of oil imports on state conservation programs.

THE RESULT IS A FLOP. The mountain labored and brought forth a malformed mouse. The report contributes exactly nothing to a better public understanding of conservation. If anything, it simply adds to the confusion of thinking on both conservation and imports.

The Oil and Gas Journal has frequently stated that excessive imports are a threat to conservation. There are many demonstrable ways in which an excess supply of oil—from either foreign or domestic sources—interferes with maximum ultimate recovery, orderly reservoir withdrawals, maintenance of adequate reserves, and the other objectives of conservation.

The ordinary man in the street does not understand these objectives and why they are in the public interest, let alone the means for achieving them and the impact of imports on them. But he won't get enlightened by this report.

The report ignores many pertinent relationships between imports and conservation. Some others it states flatly without substantiating statistics or reasoning. It makes assertions and discusses topics irrelevant to the subject.

Though the Compact is a study group of presumably impartial regulatory agencies, much of this report is a political diatribe against importers, pipelines, integrated companies, "monopolistic forces," and foreign policies. Much space is devoted to current economic problems of small producers, including problems having only a tenuous connection with the subject of the study.

The conservation aspect is what lifts the oil-imports problem out of the realm of ordinary controversies over protecting domestic industries from imports competition. But consumers and voters have never been given an understandable, factual, dispassionate explanation of it.

THE COMPACT COMMISSION MUFFED its opportunity —its obligation—to give a factual explanation of how a large quantity of uncontrolled oil affects conservation of the nation's resources, an explanation free from irrelevant or unsupportable arguments of any industry segment.

This is one more example of the oil industry's ineptness in public affairs. This report does nothing to clarify the imports controversy, advance the cause of conservation, or enhance the stature of the Interstate Oil Compact Commission.

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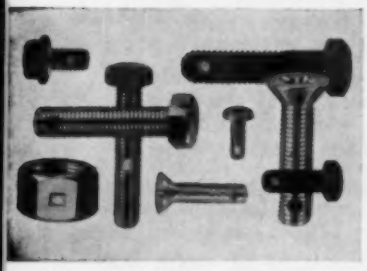

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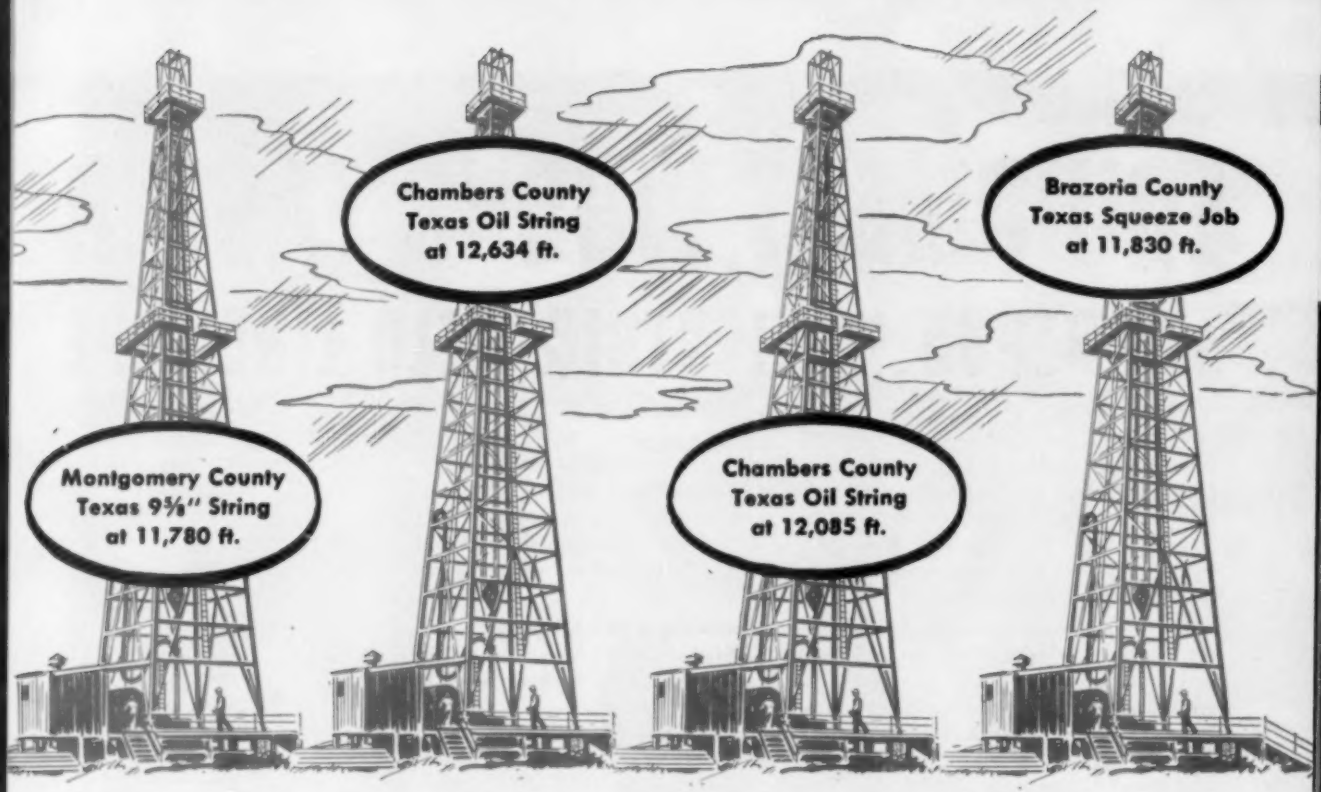

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Equally outstanding is today's 'Starcor' performance at the greater depths made possible by improved equipment and methods. In the deep, hot Texas Gulf Coast wells, for example (typical jobs, listed above), 'Starcor' is performing perfectly, adding a new chapter to a distinguished service record.

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the OIL AND GAS JOURNAL

December 9, 1957

Drilling Crews Again Target of Labor

It's the second union attack on Permian basin drilling contractors, and this time it's better organized, more effective. First NLRB elections this week will give industry an insight into what's ahead.

ORGANIZED LABOR has switched its tactics and is well along on a determined drive to unionize drilling crews.

Beaten back last summer in a premature effort to enforce its demands on Permian basin contractors via threats and picketing, labor is now pursuing a slower and apparently more effective course.

The union primarily involved is Local 672 of the International Union of Operating Engineers. And the main battle arena is still the Permian basin, which claims more rigs and contractors than any similar area in the United States.

The present union course has basin contractors worried. Some frankly admit being at a loss as to how to counter. Briefly, this is what the union is doing. After it picks its contractor target, it:

. . . Works on crewmen until it has signatures of at least 30 per cent of contractor's employes authorizing union to act as their bargaining agent. It then:

. . . Petitions the National Labor Relations Board in Washington to order an election whereby contractor's employes decide whether union should serve as their bargaining agent.

An NLRB examiner holds a hearing on the petition and the evidence is relayed to the five-man board in Washington for a decision. If everything is in order, the board orders an election. If 51 per cent of contractor's employes then vote for union representation, the union then is authorized to bargain for them with the contractor.

If the contractor refuses to bargain, he is open to an unfair labor practices suit.

Elections near . . . First elections in the basin are coming up this week. Employes of Williamson Well Service, and P. L. & B. Well Servicing Corp., both of Odessa, will vote December 10 and 11, respectively. These two companies are well-service firms, but the results will be watched as indicative of what drilling contractors themselves may expect.

An NLRB examiner already has held hearings on union petitions for elections involving five basin drilling contractors. The five are: Carl J. Westlund, Inc., and Westlund Drilling Co., Midland (regarded as one firm); Laughlin-Porter Drilling Co., Midland; Zapata Drilling Co., Midland; Choya Drilling Co., Midland; and McQueen & Stout Drilling Co., Fort Worth.

Hearings on similar petitions for elections have been set for December 12 for Forster Drilling Co., Odessa, and A. W. Thompson, Inc., Houston.

The smallest of these seven firms operates 4 rotaries, the largest 11 rigs. Together the seven operate 40 rigs.

Union spokesmen say they will file more petitions for elections involving "a lot more contractors" in the near future. So far there has been a lag of 1 to 2 months from date of hearing to NLRB action on the petition.

The key issue . . . The NLRB also is expected to rule soon on what has shaped up to be a highly crucial issue in the contractor-union battle.

This is whether or not the driller is a supervisor and therefore ineligible for union membership under present labor laws.

The issue was fought before an NLRB examiner in a hearing in Midland early in October.

The union says he is not a supervisor, primarily because he does manual labor. The contractors maintain he is a supervisor in that he acts in a hiring capacity for the contractor.

It commonly is the practice for a contractor to hire only the driller, assuming the latter has his crew. If one of the roughnecks misses work, it is normally the driller's responsibility to replace him.

The NLRB ruling thus becomes of great importance. If the board holds that he is not a supervisor, then roughnecks would, in effect, become captive members of the union. No union driller would have a nonunion roughneck on his crew. Such an order by the board would greatly simplify the union's recruiting job by permitting it to concentrate on the driller.

What the union wants . . . Here's what the union is promising rig crewmen in the basin—and the terms the union will demand of contractors it succeeds in organizing:

. . . Shorter work week with same pay. The union wants to cut weekly working hours from 56 to 48. Crewmen would work 6 days, be off 2 days.

. . . Free transportation for crews to and from rig, furnished by the contractor.

. . . Paid vacations.

. . . Larger crew. Average crew would be increased to five from the present four.

. . . Safer rigs. Union wants a set of safety standards set up and adhered to whereby old and worn equipment would have to be replaced.

Most contractors say they would be committing economic suicide if they tried to meet such demands.

Oil companies wouldn't stand still for hikes in footage rates large enough to take care of such increased costs. And contractors cannot absorb them, they say.

The drilling business, they argue, just isn't adaptable to union organization basically; there is no concentration of employes, and rigs are inevitably idle some of the time.

Chances of success? . . . The union, of course, is confident it will be bargaining for most drilling crews in the basin within a few months.

Furthermore, it claims to be at

work already in areas outside the basin, too.

O. W. Clark, organizer at Odessa, Tex., told the Journal last week that "we have people working in Oklahoma and on the Gulf Coast right now." He pointed out that the union's charter covers all of the continental United States.

He said the union is concentrating at first on the small and medium-sized firms because it can more easily reach and sign the required percentage of their employes.

He asserts that there are no particularly tough problems in organizing the crews of the big contractors, however. And that the union definitely will tackle them, too. "We have people in every city of any size in the country. Reaching the crews of the big firms won't be an impossible job by any means. Then, too, it's not essential to deal with the firm as a whole. We can carve out a unit with NLRB approval—in the Permian basin, perhaps, or some other area.

Clark said any contractor refusing to bargain with the union following an election won by the union would meet with court and NLRB action. The union also will file unfair labor practice suits against any contractor who fires crewmen for belonging to the union.

Clark said the union already has filed several such suits. One, against Cactus Drilling Corp., San Angelo, was settled out of court. Others have been filed against Montex Drilling Co., Midland; Texas Oilwell Service Co., Odessa; and Booker Well Servicing Co., Lovington, N. M.

Contractors differ . . . Contractor opinion is widely divided as to how serious a threat this most recent union drive presents.

An official of one of the firms now awaiting an NLRB ruling on an election is deeply pessimistic. He says the union's present approach appears unbeatable. If it gets and wins the election, he said, "there is little we can do but try to live with it or close up shop."

Another in the same boat is determined to fight the union all the way. He sees nothing to prevent the firm from refusing to bargain with the union should it win an election. The company would replace crewmen belonging to a union as fast as possible, too, he said.

The nation's biggest contract drilling firm, Loffland Brothers Co., Tulsa, appears to be not much worried. R. W. Wire, president, says the union will get nowhere trying to organize the big contractors. No such attempts have yet been made, he said.

Another California Contractor Quits

INTERNATIONAL Drilling Co., of Long Beach, last week became the fourth California drilling contractor to go under in recent months. It blamed rising costs and diminishing profits.

International joined Gene Reid Drilling Co., Green & Heiser Drilling Co., and U. S. Drilling Co. in throwing in the towel. The four firms owned a total of 15 rigs.

Ironically, International folded at a time when drilling activity is greater than a year ago, based on notices of intent to drill filed with the state oil and gas supervisor.

In California, though, the contractors in trouble are those with medium-depth rigs. Contractors say the company with modern, deep rigs can make a decent profit and have plenty of work on 10,000-ft. and deeper holes. And the firm with shallow rigs has been finding plenty of work in recent months on holes above 4,000 ft. in the state's heavy-crude fields.

Wire said the union had "failed miserably" in an attempt to organize drilling crews on the West Coast. It succeeded in negotiating some contracts, but "they were not enforced. The biggest contract was with an eight-rig company. It was a 1-year contract, and after the first year it was not signed again."

Wire sees no reason why the union should be any more successful in its efforts in the basin or other areas.

Several contractors express fears that the operating engineers may enlist the aid of larger and more powerful unions such as the Teamsters. Via such an alliance, they think, contractor supplies could be cut off.

Various other oil unions, one contractor said, could perhaps apply pressure by refusing nonunion contractors access to leases.

A contracting official with an on-the-scene impression of the situation is H. Don Johnson, executive vice president of Carl B. King Drilling Co. of Texas, Midland.

Though his firm is not yet involved, Johnson is deeply concerned about the present union drive and was an interested spectator at some of the November NLRB hearings involving competitors.

"They (the union organizers) aren't playing," he says, "and for the first time I'm afraid they have a fair chance of succeeding."

If the union does manage to entrench itself firmly in the basin and to enforce its demands there, Johnson thinks it would be only a matter of time until the entire industry was organized.

Effects of unionization . . . This, Johnson thinks, would mean that contractors would lose much of the strong advantage they now have over company-operated rigs.

It would mean, he feels, that the union could push for and probably win some sort of guaranteed annual wage for drilling crews, as well as higher wages, shorter hours, paid vacations, more and larger crews, and other fringe benefits. The union, Johnson says, would have to go for these things to justify its existence.

It already is pointing out to prospective members that most oil company rig crews now have most of these benefits. It is saying that the reason they do is because they are union men—members of OCAW or smaller independent company unions.

The ultimate effect of union success in the basin would be a sharp hike in drilling costs to the operator—and at a time when he can ill afford higher costs, Johnson says.

J. W. Bates, Jr., of Reading & Bates, Inc., Tulsa, likewise thinks that any pattern of shorter hours and higher wages set in the basin would spread quickly. If the union once gets a foothold, he said, it eventually could "sack everybody up, large and small contractors alike."

A shorter work week, Bates feels, would mean a loss of operating efficiency. The big problem, though, would be to find enough skilled labor.

"A contractor would need an extra 33 per cent skilled labor—and there aren't enough good drillers as it is."

"Inefficiency and complacency on the part of crewmen" is predicted by Lee Daniel, vice president in charge of drilling for Helmerich & Payne, Inc., if rig crews are unionized. Such intangibles would further add to direct costs incurred from meeting union demands.

Lloyd Hansen, drilling superintendent for Arrow Drilling Co., is one of those who thinks that the contractor could not survive if rig crews are successfully organized. He thinks a 40-hour week wouldn't hurt too much if the contractor had steady work for his rigs. But, he says, this is seldom the case—and crewmen would be on the payroll whether or not their rig was running.

Construction costs on Trans-Canada pipeline are ranging from an average of $3.50 a foot in the flat prairie areas (left photo) to $10.19 in the rocky sections of Ontario. The rugged Ontario terrain points up that . . .

Finishing Trans-Canada Will Be Tough

CONTRACTORS bidding for spreads in the Ontario section of Trans-Canada pipeline showed a healthy respect for a shield of rock that covers much of the province.

Contracts awarded for five spreads covering 367 miles of 30 in. in Ontario average $10.19 a foot. This is almost three times the average cost of $3.50 of laying 20 and 24-in. pipe from Toronto to Montreal and almost twice the $6 average of laying 34-in. on the western section of the Alberta-Winnipeg part of the line.

One contract awarded Morrison-Shivers, Ltd., for a 48.1-mile spread in Ontario averaged $16.03 a foot (see table). Some of the bids were $10 a foot higher than the price at which spreads were contracted.

Northern Ontario Pipe Line Crown Corp., owned by the Ontario and Canadian governments, has released all bids submitted on the section from Port Arthur to Kapuskasing, Ont. The five contracts awarded for the section total $20,827,789. The section will be laid next year.

Tough ditching problems are the principal reason bids skyrocketed.

One section in Ontario has 35 miles of solid rock ditch, and near Port Arthur 60 per cent of the ditch required some rock excavation. The entire section from the Manitoba-Ontario border eastward to Kapuskasing is Precambrian rock shield. This is in sharp contrast with the Toronto-Montreal territory. While drills, dynamite, and backhoes carve out the ditch foot by foot through rock in Ontario, the ditcher east of Toronto can make 20,000 ft. a day.

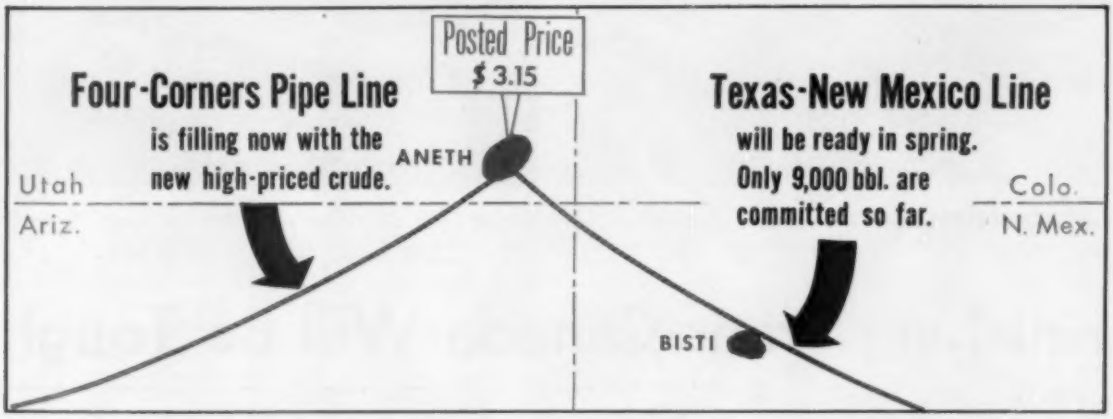
Bids Were High for the Ontario Section of Trans-Canada

(Winning bidders in bold type)

		Bids	Per ft. cost of winning bid
Spread V: 63.6 Miles			
1.	Morrison-Shivers, Ltd.	$3,597,322.36	
2.	Majestic Contractors, Ltd.	3,741,719.80	
3.	**Nelen Ltd. and Associates**	**4,069,972.12**	**$12.12**
4.	Houston Contracting Co.	4,408,298.68	
5.	Price-Poole	4,571,165.56	
6.	Mannix Co., Ltd.	4,601,388.28	
7.	River Construction Corp., Ltd.	4,769,292.28	
8.	Conyes-Bechtel	6,038,645.40	
9.	Dutton-Williams Brothers, Ltd.	6,444,974.20	
Spread W: 48.1 Miles			
1.	**Morrison-Shivers, Ltd.**	**$4,070,590.48**	**$16.03**
2.	Majestic Contractors, Ltd.	4,335,815.44	
3.	Mannix Co., Ltd.	4,641,844.20	
4.	River Construction Corp., Ltd.	4,833,112.24	
5.	Price-Poole	5,383,964.08	
6.	Nelen, Ltd., and Associates	5,697,643.60	
7.	Dutton-Williams Brothers, Ltd.	6,483,117.52	
8.	Conyes-Bechtel	6,982,963.20	
Spread X: 70.9 Miles			
1.	**Majestic Contractors, Ltd.**	**$3,815,308.16**	**$10.19**
2.	Morrison-Shivers, Ltd.	4,773,649.28	
3.	Price-Poole	4,912,159.52	
4.	Mannix Co., Ltd.	4,998,260.48	
5.	River Construction Corp., Ltd.	5,204,154.08	
6.	Nelen, Ltd., and Associates	5,413,791.20	
7.	Conyes-Bechtel	6,424,540.60	
Spread Y: 91.3 Miles			
1.	Majestic Contractors, Ltd.	$4,214,964.28	
2.	**River Construction Corp., Ltd.**	**4,807,903.00**	**$9.97**
3.	Mannix Co., Ltd.	4,856,109.40	
4.	Morrison-Shivers, Ltd.	5,733,465.88	
5.	Price-Poole	6,070,910.68	
6.	Conyes-Bechtel	6,446,918.20	
7.	Houston Contracting Co.	6,914,522.68	
Spread Z: 92.9 Miles			
1.	Majestic Contractors, Ltd.	$3,696,144.07	
2.	**Mannix Co., Ltd.**	**4,064,015.20**	**$8.29**
3.	River Construction Corp., Ltd.	4,250,409.76	
4.	Morrison-Shivers, Ltd.	5,040,134.08	
5.	Houston Contracting Co.	5,545,361.44	
6.	Conyes-Bechtel	5,628,746.60	
7.	Price-Poole	5,766,091.84	

California Bids for Four Corners Crude

● Price of $3.15 posted by California Standard and Shell puts a crimp in plans of Gulf and Mid-Continent buyers. Here's the question: Will the new Texas-New Mexico line get any business?



WEST COAST crude buyers have come out with the strongest bid for Four Corners crude and have put buyers on the Gulf Coast and in the Mid-Continent at a disadvantage.

Two majors have posted a $3.15-per-barrel price in the area.

The posting is causing concern among owners of the Texas-New Mexico Pipe Line Co.,* which has started construction of a 512-mile line to move Four Corners crude southeast. The price is much higher than buyers who had considered taking Four Corners crude had intended to pay.

The problem is added to another already building up—how to allocate production in separate regions of New Mexico soon to be tied together when Texas-New Mexico Pipe Line is completed next spring.

Texas-New Mexico Pipe Line has a commitment only from The Texas Co. to take Four Corners crude, and this commitment will account for only a fraction of the new line's capacity of 60,000 bbl. per day. Texaco now has an estimated production potential of 9,000 to 10,000 bbl. per day in the area, 95 per cent of it in Aneth field.

J. W. Emison, president of Texas-New Mexico, says he hopes shippers will "stay with us" but admitted that if they don't "we're in bad shape."

The price . . . Standard Oil Co. of California was the first to post the $3.15 price, effective November 1, and Shell Oil Co. followed suit November 20. The nearly completed 750-mile line of Four Corners Pipe Line Co. to California now is being filled with the $3.15 crude.

The California Standard posting applies only to San Juan County, Utah, while Shell's price affects Aneth, Desert Creek, and Ratherford pools in Utah, and Bisti pool in New Mexico. The $3.15 price is for 40°-gravity crude and above. It ranges downward 2 cents per degree to $3.07 for 36° in the case of California Standard and to $2.73 for below 20° in the case of Shell.

It is doubtful that buyers who use the Texas-New Mexico line, which goes into operation next spring, could purchase crude in Four Corners at a price lower than is being paid by West Coast buyers. As one price authority said: "I don't think the Indians (owners of Four Corners producing land) would allow two prices."

The only previous posting in the field was El Paso Natural Gas Co.'s $2.90. The new price is, in effect, a 25-cent increase. But El Paso, which has a refinery in the area, met the $3.15 price last week.

The problem . . . Spokesmen for Texaco and Texas-New Mexico Pipe Line say frankly the high crude posting has created a problem, but there is no thought of abandoning the line.

They point out that Aneth sweet crude makes an excellent lube-oil base stock meeting Texaco's refinery requirements on the Gulf Coast. They are counting on others to buy crude from the same area for the same reason.

One official says he doesn't know yet whether buyers east and south of Four Corners "are more interested in price or the crude—that's something each company will have to decide for itself."

Except for the Texaco commitment —not actually firm itself—the Texas-New Mexico line has no assurance of other business. However, the line is counting on some producers in Four Corners, like Texaco, to move their own crude to their own refineries.

One Texaco official says he "assumes" there will be a problem of filling the line because "there appears to be plenty of oil" in the Mid-Continent. "We hope to have an increase in demand."

Emison's position is simply one of watchful waiting: "I don't know what the effect (of the $3.15 price) will be on the pipeline. We understood some shippers wanted the crude for the Texas Gulf Coast. If not, we're in bad shape. We will just establish a tariff and hope shippers will stay with us.

"We are assuming The Texas Co. will ship over the line. We haven't any firm commitments from anybody else. People in the general area are talking to us, but there is no question but what the initial volume will come from The Texas Co."

The owners . . . The Texas Pipe Line Co. owns 45 per cent of Texas-New

Mexico stock and is the only owner (through Texaco, the parent company) of major production at this time in Four Corners. Sinclair Pipe Line Co. owns 35 per cent, Tidewater Oil Co. 10 per cent, and Empire Gas & Fuel Co. (Cities Service) 10 per cent.

The operators say the 16-in. line from Four Corners to Jal, N. M., should be completed by early April, a month ahead of original schedule.

Construction crews have strung 250 miles of pipe and have completed nearly 100 miles of ditching.

Allowable problem . . . The Texas-New Mexico line has created another problem—this one for officials of the New Mexico Conservation Commission and state oil producers.

By moving Four Corners production to the southeast, the pipeline places crude in northwestern New Mexico in direct competition with crude produced in southeastern New Mexico.

Only last month the New Mexico commission set a separate allowable for northwestern New Mexico production on the assumption that all the crude would move west. Next spring the Texas-New Mexico line may bring a change.

One staff member of the New Mexico commission contends there is no conflict at least for the present, because the Texas-New Mexico line plans to take no oil from the New Mexico portion of Four Corners.

The new allowable gives northwestern New Mexico 868 bbl. per month for each 40-acre unit, plus another 50 per cent to meet added demand. The excess would be charged against future allowables. Southeastern New Mexico's allowable is 1,147 bbl. per month—and more for wells deeper than 5,000 ft.

Frank B. Whitaker, Jr., manager of Texas-New Mexico Pipe Line at Midland, Tex., confirms that his line does not plan at this time to take northwestern New Mexico crude—but only because there are no buyers.

"We didn't agree to anything," he explains. "We are a common carrier. If you sell oil and have a buyer, we will move it for you. Eventually there will be competition, but every indication right now is that the two areas will be separate."

Producers in southeastern New Mexico are apprehensive and can be expected to demand equality on allowables if, and when, competition occurs.

Whitaker says that eventually it will not be economical for oil in the eastern section of Four Corners, such as New Mexico's Bisti field, to move westward to the Pacific Coast. Texas-New Mexico will have a pump station at Bisti, but there are no plans at this time to build a gathering system there.

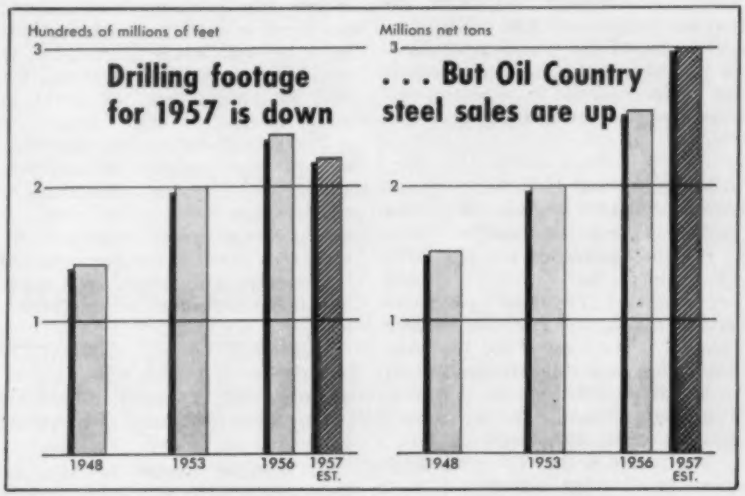
"But we may be approached with the idea of gathering crude," he says.

The commission . . . As the New Mexico production from Four Corners becomes a larger factor in the oil industry, the state's conservation commission will grow in importance.

The commission is composed of three members—two of them elected by the people and one appointed.

Gov. Edwin L. Mechem, a Republican, is one elected member, and Land Commissioner Murray Morgan, a Democrat, is the other. A. L. Porter, secretary-director of the commission and state geologist, is the third member. He is appointed by the governor. He took office last spring after serving 7 years as proration manager for the commission's Hobbs office.

Mechem and Morgan look to Porter for technical advice. While he is the strong man of the trio in oil matters, Porter's authority is not absolute. Dan Nutter is the district engineer and, as such, is a key man in the New Mexico oil conservation program.



Big Sales Mean Big Inventories

STEEL SHIPMENTS to the oil country this year are at a record high despite the drop in drilling.

It sounds like a paradox, but there's an explanation—heavy inventories.

The American Iron and Steel Institute has released figures showing that shipments this year of oil-country goods—tubular steel used in drilling—will hit a record estimated 3 million net tons, well above last year's record of 2.6 million tons.

Drilling footage this year will be approximately 224,000,000 ft., down from last year's 234,000,000 ft.

Inventories of both supply houses and drillers are at a high level to explain the oddity in the figures. Buyers stocked up heavily prior to last summer's steel price increase, and they still have plenty of steel goods in their sheds and warehouses.

The institute said that 75 per cent of the oil-country goods consists of well casing, 20 per cent tubing, and the remaining 5 per cent drill pipe.

Record sales of line pipe also were recorded this year. Shipments totaled nearly 4.5 million net tons, compared with 1950's record year of 3.7 million.

The industry is expected to complete 16,850 miles of pipeline this year, compared with 14,100 miles in 1956. The 1957 figure is short of the 17,745 miles completed in 1954, but the average size of pipe used is growing each year.

For the oil industry as a whole, steel shipments will hit a record of nearly 7 million net tons, compared with last year's record of 5.6 million.

The institute reported also that exports of oil-industry steel should top those of last year by a wide margin. In 1916 the total was 602,469 tons. For the first 7 months of this year the total was 576,496 tons, or an annual rate of 64 per cent above that of last year.

Crude Line to Montreal

. . . backed by four Alberta independent operators. Some majors doubt economics of such a line, but independents hope to promote a new market for their crude.

FIRST STEP in a long-talked move to build a second crude pipeline from Alberta to eastern Canada has been taken by a group of independent oil companies based in Calgary.

The group includes Pacific Petroleums, Ltd., Home Oil, Ltd., Canadian Homestead Oil, Ltd., and Merrill Petroleums, Ltd. The companies have filed the registered name of East Coast Transmission Co. with the federal secretary of state in Ottawa.

Purpose of the new firm, as listed in registration papers, is to transport oil from Alberta to Toronto and Montreal. Further details were not revealed.

Alberta in bind . . . Idea for an Alberta-Montreal pipeline has been gathering steam for months.

Present squeeze in which Alberta oil producers find themselves is adding pressure. December's expected production of 293,992 bbl. daily is down 33 per cent from the same month last year. Markets for Alberta crude are dwindling on the U.S. West Coast and Great Lakes regions and in the Toronto area.

The reason is this: Lowered tanker rates are making foreign oil more attractive now to West Coast refiners. Unprorated Saskatchewan oil now coming to market in growing volume is edging some Alberta crude out in the Great Lakes and Toronto.

That explains the present eager hunt by Alberta independent producers for new markets.

Montreal lure . . . The lucrative Montreal refining area with a daily demand of nearly 250,000 bbl. is being served by imports from South America and the Middle East.

Physical facts explain why this area is not served with Canadian crude. Interprovincial Pipeline Co. now takes Alberta crude to eastern Canada, but it terminates at Toronto. Present capacity of this line is 235,000 bbl. daily between Edmonton and Regina and 111,000 bbl. in its eastern extremity between Sarnia and Toronto.

Interprovincial could not carry the extra demand even if an extension were built into Montreal. There have been reports that Interprovincial might loop its lines, but nothing definite has developed.

Many majors operating in Canada question the economic feasibility of an Alberta-Montreal line. Several factors are cited:

. . . Refining market in Montreal isn't large enough now to justify such a long line.

. . . All Montreal refiners have access to their own foreign crude and it's doubtful they would use higher-priced Alberta crude.

. . . Alberta crude put down in Montreal would be from 25 to 50 cents per barrel more expensive than foreign crude. Official action to increase pipeline tariffs at intermediate points so they could be cut for Montreal would be necessary. Or a tariff could be imposed on imported crude. In either case Canadian consumers would be penalized.

These arguments, however, haven't deterred Alberta independents from clamoring for a market for their oil.

Westcoast Has Ideas, Too

WESTCOAST Transmission Co. may build a big-inch crude line to parallel its 650-mile, 30-in. gas line from Peace River to Vancouver, B. C.

Engineering and economic studies are in progress to determine reserves and line costs. Westcoast is interested in providing an outlet for fields being developed in the Boundary Lake, Fort St. John, and Buick Creek areas of British Columbia. The affiliated Pacific Petroleums, Ltd., is active in those regions.

The soft crude market, financing, and the early stage of development of the fields indicate construction of a line might be 2 years away. A similar line to go to Bella Coola instead of Vancouver has been planned by Act Oils, Ltd., owned by Canada Southern Petroleums, Ltd., and others.

Imperial Labor Dispute Ends

THE STRIKE at the Imperial Oil, Ltd., refinery near Vancouver, B. C., has ended, but the refinery will remain shut down for turnaround until the first of the year.

The 9-week-old strike by members of the Oil, Chemical, and Atomic Workers Union ended when management agreed to boost wages by 11 to 22 cents per hour for the 246 workers.

Hourly wages will range from $1.78 to $2.74, effective September 1. The agreement also includes a lump sum of $144 per man in lieu of wage retroactivity to last spring.

When the strike was called September 24, the 25,000-bbl. refinery was preparing for turnaround. Normal delivery of crude to the plant will be resumed within 3 or 4 weeks.

Refiners Squeezed

by contract to buy Elk Hills crude, ask Navy to end deal

TWO CALIFORNIA independent refiners have asked the Navy to relieve them of contracts to buy 10,500 bbl. daily of crude from the Naval Reserve at Elk Hills.

Both refiners claimed they were being forced to cut down operations because of an oversupply of crude and products on the West Coast caused by excessive imports.

The first cancellation request from Douglas Oil Co., brought threat of legal action by the Navy unless the company continued to take delivery of Elk Hills crude. Since then, however, the Navy has agreed to see if a trade of refined products for crude can be worked out to give the refiners some relief.

The two refiners, Douglas and Mohawk Petroleum Corp., negotiated their 5-year contracts with the Navy at the height of the Suez crisis. At that time it appeared crude would continue to be scarce in California. Both agreed to pay 12 cents a barrel premium above posted price for the Navy crude.

Shortly after the deal was made, the Suez crisis eased. Tanker rates dropped and imports soared. Since then product stocks also have reached record highs on the coast. All of this has squeezed independent refiners like Douglas and Mohawk who have limited storage facilities.

The crude for which Douglas and Mohawk are paying a 12-cent premium can now be bought from foreign sources and laid down at Los Angeles for 57 cents a barrel less, according to George T. Goggin, executive vice president of Douglas.

At the time the contracts were made, Douglas planned to use its Elk Hills crude as part of regular refinery runs. Because of the weak products market, it has had to cut runs one-third in recent months, Goggin said.

Racial Bias Ebbs

in most processing plants, special committee finds.

REFINING and petrochemical industries in the Southwest are making slow but apparently steady progress in combating racial discrimination in employment.

That is the word following the release of an annual report by the President's committee on government contracts.

With 4 years of experience behind it, the committee now is preparing to take the offensive in eliminating racial and religious discrimination among government contractors.

This will take the form of an annual examination of employment practices in plants of the Government's principal contractors.

"This can be a far more effective way of eliminating discrimination than waiting for a complaint to be filed before an investigation is made," Vice President Richard Nixon, chairman of the committee, said.

Government agencies also are being asked to consider the past nondiscrimination performances of employers before awarding contracts, Nixon said.

The report did not discuss the situation in the gulf area refineries. A spokesman for the committee, however, said the big problem there is eliminating the double promotion and seniority lists used in the industry. This practice limits the chances of advancement for Negro employes, the committee official said.

Washington Test Planned

SUNSHINE MINING CO. plans to spud a third test of its holdings in the Ocean City, Wash., area, where its recent discovery well gave Washington its first producing well.

Sunshine will select one of three locations for the test, all of them south of the discovery well, 1 Medina. Two are in the same vicinity while the third, 1 Minard, is 5 miles south in the Duke Lake region. Drilling at the 2 Medina, a northwest offset to the discovery, was suspended recently when casing collapsed.

In the state's other major drilling project, Standard Oil Co. of California, Western Operations, Inc., is drilling ahead below 6,967 ft. on a wildcat in the Rattlesnake Hills of Benton County, southeastern Washington.

watching WASHINGTON

. . . with Bertram F. Linz

West Coast controls next?

THE CABINET COMMITTEE will decide before the end of the year whether to put the West Coast under import control. The most expected answer: Yes.

The importers' own figures show that they plan to bring in close to 250,000 bbl. daily of crude through the first half of 1958. That is almost 75,000 bbl. a day more than the cabinet committee figured 1957 last-half receipts would be.

Some of the importing companies held that their present need for foreign oil is only "temporary." There is some argument on that point in Washington as well as in California.

While District 5 is seen as going under the import program next month, it is not expected that the formula urged by the Oil Producers Agency of California will be adopted (OGJ, Dec. 2, p. 62).

The agency called for a 173,000-bbl. quota. That, it said, is the margin between local output, crude, product, and natural-gas liquids receipts and total demand.

More likely the cabinet group will set a figure which will give the importers some room but still spur District 5 producers to keep on looking for new oil. But one area may still be left free of control, the two northwest states, Oregon and Washington, which present a special problem.

NATO looks at oil

OIL FOR WAR was a feature of last week's meeting of the North Atlantic Treaty Organization at Paris.

The NATO petroleum planning committee held a series of sessions as the heads of the NATO nations met to review the world situation.

This committee does the planning for oil supplies for the NATO area in the event of war. Hugh A. Stewart, director of Interior's office of oil and gas, headed the U. S. delegation.

The petroleum group meets annually to update its plans. But this year a new factor was added. Russia's claimed perfection of long-range missiles has to be reckoned with in Europe, just as it is being thought about by our own defense officials.

Planning for NATO oil needs in time of war is more than just figuring local supply and demand. It covers the world because all the democratic nations would draw from a common pot in such an event.

Oil investigations are in style

IF ANYONE DOUBTS that the oil and gas industry is the nation's No. 1 whipping-boy, take a look at the record.

Grand jury investigations are going on all over the place—Alexandria, Va., and Washington, D. C., on oil, and Milwaukee on natural gas.

The Justice Department has four suits pending against pipeline companies for alleged violation of the 1941 consent decree. And more are likely to come as Congress presses for action.

A District of Columbia court ruling has tied up millions of dollars of pipeline rate increases. It closes the door to such increases unless all customers agree.

The Justice Department has been warned not to accept a consent settlement of the long-pending cartel suit. A congressional probe could follow any department action along that line.

A federal court at Denver has turned down gas producers' claims that wellhead sales are not subject to federal control.

That's only part of the picture. The Justice Department is probing West Coast pipelines. The Federal Trade Commission is firing charges at filling station suppliers. And there is more, as oil men here and there know from their own experience.

Gulf Gas Reserves Up

. . . in latest estimate. Davis sets proved reserves at 12 trillion cubic feet—much higher than earlier estimates.

PROVED natural-gas reserves underlying the Gulf of Mexico were estimated last week at about 12 trillion cubic feet.

This appraisal—much more optimistic than earlier estimates—was made by Ralph E. Davis, one of the nation's foremost consulting geologists. It is based on a study, just completed by the Houston consultant and his staff, of proved reserves as of last January 1.

Davis presented his analysis of current and potential reserves in Houston at the Institute on Offshore Drilling Operations. The 2-day institute was sponsored by the University of Texas school of law.

In addition to 12 trillion cubic feet of gas, Davis estimated proved reserves of liquid hydrocarbons as of last January 1 at 1 billion barrels off the coast of Louisiana alone.

The oil-reserves figure is only slightly higher than the previously accepted total. However, earlier estimates of proved natural-gas reserves had placed the total as low as 4 to 5 trillion cubic feet.

A 25-year figure . . . "It is my estimate," Davis said, "that the present tempo of offshore drilling is yielding approximately 3 trillion cubic feet of gas and 325 million barrels of liquid hydrocarbons of new reserves per year. If this offshore discovery rate continues for the next 25 years, the resulting additions to proved reserves would be 75 trillion feet of gas and 8,125 million barrels of liquid hydrocarbons."

He pointed out that estimated known reserves as of last January, together with past production, would increase the 25-year estimate to 87 trillion cubic feet of gas and 9,125 million barrels of liquids.

"None of us would assume that offshore exploration drilling will be ended within 25 years," he added. "Onshore exploration has been in progress since 1901 and may continue another 25 years or more."

Looking onshore . . . Davis compared the offshore sediments with those along the coast in South Louisiana and District 2, 3, and 4 in Texas.

As of January 1, Davis estimated ultimate recoverable proved reserves in this land area at 135 trillion cubic feet of marketable gas and 20 billion barrels of oil and liquid hydrocarbons. Of these totals, 33 trillion cubic feet of gas and 9.5 billion barrels of liquids already have been produced.

RALPH E. DAVIS
. . . optimist on offshore gas.

"The future of discovery in this area is anybody's guess," Davis said, referring to the inland area. "My neck is out with a guess that we may add something on the order of 50 to 75 trillion cubic feet of gas and of the order of 5 billion barrels of oil and other liquid hydrocarbons."

Davis has consistently taken a more optimistic view of offshore possibilities than have many others in the industry. As early as 1952 he estimated ultimate offshore gas reserves at approximately 50 trillion cubic feet.

"I feel sure we will find the 50 trillion, and may find very much more," he said last week. If gas discoveries in the Gulf of Mexico total 100 trillion cubic feet., he said, "we are likely to find about 10 billion barrels of liquid hydrocarbons."

Word of caution . . . The renowned consultant cautioned that estimates of potential offshore reserves may be over-optimistic if they are based purely on the discovery record of the inland area along the Texas and Louisiana coasts.

By assuming that offshore sediments will yield as much oil and gas per cubic mile as their inshore counterparts, ultimate offshore reserves may be estimated at about 240 trillion cubic feet of gas and 30 billion barrels of liquid hydrocarbons.

That is 70 per cent as much gas and about one-third as much oil as has been found in the entire United States to date, Davis noted. He emphasized that such estimates, in his opinion, are wishful thinking.

Gas Case Review

is asked by FPC to remove customer control on rates

THE FEDERAL POWER Commission moved last week to secure a quick Supreme Court review of a lower-court decision that has thrown the entire gas pipeline industry into confusion.

FPC Chairman Jerome K. Kuykendall asked the Solicitor General to file on immediate appeal from the District of Columbia Appeals Court ruling in the United Gas Pipe Line Co. case.

That court held that the FPC could not accept for filing any pipeline company request for higher rates unless the consent of all its customers had first been secured. The ruling is a threat to consumers, Kuykendall said.

Threat to industry . . . The case is of major importance, Kuykendall added.

It calls for radical changes in rate procedure which was believed provided in the Natural Gas Act.

The effect of the decision will be adverse to consumers, because the financial stability of many pipeline companies may be impared or destroyed. Existing service will be hampered or ended. Necessary expansion of the industry will be prevented, Kuykendall declared.

The FPC, meanwhile, attempted last week to convince the appeals court that its decision should be reconsidered.

It did this in argument presented in a second case involving a United customer, Wilmot Gas & Oil Co., whose motion to dismiss the pipeline's new rate schedule had been denied.

The first court decision involved the city of Memphis and the Mississippi Valley Gas Co., and is termed in gas circles the "Memphis case." The petitioners in that suit also had filed motions to dismiss which were denied (OGJ, Dec. 2, p. 70).

Since both cases involved the same issue, the FPC had asked that they be heard at the same time. The court, however, decided to try them separately.

As a result of that action, the FPC was given a second chance to argue the legality of filings under Section 4(d) of the Natural Gas Act.

What's involved . . . The Memphis decision, if upheld by the Supreme Court, threatens some $300 million in pipeline rate increases. Many Washington gas lawyers expect that it will be affirmed.

Full impact of the decision has not yet been assayed by pipeline counsel. But they see in it a bar to pipeline rate increases and the freezing of producer prices, leading eventually to lack of needed additional gas supplies for distributing companies.

Even escalations written into original rate schedules would be barred by the court's ruling, it is believed.

New Regulations

governing production in Oklahoma should be ready before January 1.

THE OKLAHOMA Corporation Commission has delayed announcement of its long-awaited proposed new production regulations because it is acquiring more information on what to do with water-flood wells.

Commission Chairman Ray C. Jones said last week the regulations should be ready before the year's end. The commission will conduct public hearings before putting the revised production program into effect.

The regulations cover field operations and allowables. They are designed to plug production loopholes and set new standards for oil output by well and field.

Jones said the commission has hired independent engineers to determine whether water-flood production can be curtailed without hurting ultimate recovery.

Water-flood production accounts for about 135,000 bbl. per day, or 20 per cent, of the total production in Oklahoma—"and it is growing all the time," Jones said. At present approximately 95 per cent of the water-flood projects are allowed to produce at capacity.

The commission is concerned about the high percentage of the state's allowable coming from water floods, Jones said. This means drastic curtailing of other production.

Jones did not disclose the names of the engineers hired to make the study for the commission. None of the proposed new regulations will be announced until the study is completed and the entire program is ready to release to the industry.

Premium Gasoline Hits 98.4

THE TREND in premium gasoline octanes—moving sideways since June—rose sharply to a new high for the year in November.

Ethyl Corp.'s monthly survey of antiknock quality found the national weighted average in November at 98.4 research octane, up 0.3 octane from October. This was only the third time in the past 2 years that the premium average jumped so much in a single month.

November's rise put the month's average 0.2 above the year's previous high, 98.2, reached in June and equalled in September. At the same time it was 1.1 octanes above a year ago and 2.3 octanes above November 1955.

While premium took a sharp jump in November, the national weighted average for regular moved up only 0.1. This brought regular up to the 1957 high, 91, set in June. Since then it rocked along steadily at 90.9.

Particularly noteworthy in November was the fact that in 10 cities premium averaged 99 octane or above (see table below). In October there were only two cities in this category. The 10 are Baltimore, Boston, Buffalo, Hartford, Little Rock, Newark, New York, Pittsburgh, Richmond, and Toledo. New York and Toledo were tops, each averaging 99.4 for their premium.

Four companies are selling 100-plus octane as their premium. An arithmetical average of five samples from one company was 101.1 research octane. Another company averaged 100.7 octane. These compared with an arithmetical average for the 35 samples of third grade of 101.15. Third-grade brands ranged from a low of 100.3 octane to a high of 102.2 octane.

A breakdown of the 57 cities sampled by octane group follows:

Premium

Group:	Nov. 1957	Oct. 1957	Nov. 1956
93-93.9	0	0	2
94-94.9	1	1	2
95-95.9	3	2	1
96-96.9	0	1	20
97-97.9	7	8	26
98-98.9	36	43	5
99-99.9	10	2	0
Cities	57	57	56

Regular

Group:	Nov. 1957	Oct. 1957	Nov. 1956
83-83.9	0	0	1
84-84.9	1	1	0
85-85.9	0	0	2
86-86.9	1	1	4
87-87.9	4	1	6
88-88.9	8	12	11
89-89.9	18	17	11
90-90.9	4	4	4
91-91.9	5	6	9
92-92.9	12	13	8
93-93.9	4	2	0
Cities	57	57	56

Fight Set on U.S. Leasing Ban

INTERIOR Secretary Fred A. Seaton will learn this week why the oil industry doesn't like his plan to ban oil and gas development on millions of acres of government lands.

Many oil producers and associations are expected to testify at hearings on a plan to close off wildlife areas in the U.S. and Alaska.

New regulations barring oil and gas development were announced by Seaton in October. They reverse the action of former Sec. Douglas McKay opening the areas for leasing in December, 1955 (OGJ, Oct. 7, p. 116).

The industry opposes the new rules because:

. . . **They are** too restrictive.

. . . **They conflict** with the administration's policy of making maximum multiple use of public lands.

. . . **National security** and our economy depend vitally upon the discovery and development of new oil and gas reserves.

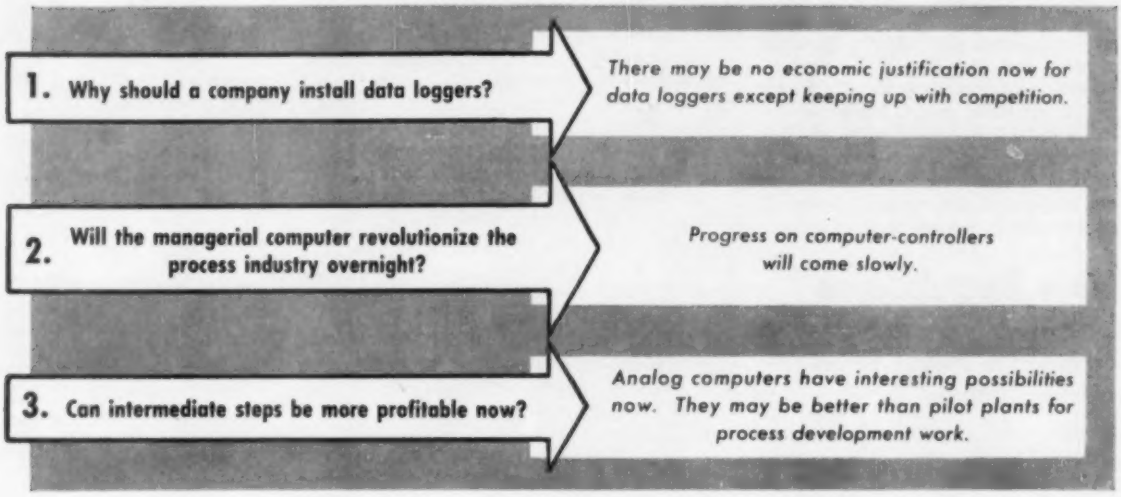
As much as 20 million acres could be taken out of development under the planned regulations. Most of the land would be in Alaska. Five million acres of it is located adjacent to the area which Seaton announced last month would be opened to leasing by revocation of Public Land Order 82 (OGJ, Nov. 25, p. 62).

Industry sources point out that development in Alaska is just getting under way. Its 375 million acres comprise the last big province for exploration under the U.S. flag.

Conservation interests which blocked McKay's order opening the wildlife refuges will fight for adoption of the new regulations. But the oil industry will argue that rules can be written that will adequately protect wildlife and, at the same time, not unduly restrict leasing.

Automation: It's Still Down the Road

● Continental Oil Co. management calls a huddle of experts to strip away all the ballyhoo over push-button processing. Oil men may be surprised at the interesting answers these scientists gave to three questions:


1. Why should a company install data loggers?
There may be no economic justification now for data loggers except keeping up with competition.
2. Will the managerial computer revolutionize the process industry overnight?
Progress on computer-controllers will come slowly.
3. Can intermediate steps be more profitable now?
Analog computers have interesting possibilities now. They may be better than pilot plants for process development work.

THREE NEW TECHNIQUES—automatic data logging, electronic computers, and stream analyzers—are proving the most promising keys to automation in the process industries. Refiners are hoping they soon can be translated into greater production and more profitable operations while at the same time bringing the day of the automatic refinery nearer.

But such a development will not come overnight, Continental Oil Co. officials concluded in a 2-day conference on advanced instrumentation held recently in Ponca City.

Continental management called the conference so that technical experts both within and outside the company could brief the company on all phases of automation. Discussions covered the present and prospective uses of automatic data logging, analog simulation and control, and stream analyzers.

Harold G. Osborn, a Continental senior vice president, pointed out much basic research is still needed in connection with refinery automation requirements and applications.

He said it is necessary to experiment with these applications to determine more widespread uses and benefits to the company and to keep abreast of competition. Osborn declared, however, that management does not have enough information at present on which even to set up a good long-term research program.

One stumbling block, another speaker said, is the shortage of qualified electronic engineers. What is needed are process engineers who also are experts in mathematics and/or electronics. These combinations are rare.

Attractive areas . . . D. R. Johnson, Conoco's manager of manufacturing, said prospects looked good immediately for automation in:

. . . Tank gaging. More accurate gaging which also incorporates temperature compensation would be helpful in checking analysis of light-oils losses and lead to greater accuracy in yield statements.

. . . Blending both gasolines and lube oils.

Johnson suggested that the company take a critical look at instrumentation now on existing units and determine how this can be improved. Other experience in the new technique will be gained when Conoco installs a data logger on a catalytic reforming unit at the Ponca City refinery.

The company also plans to look further into stream-analyzer-controller applications.

Data loggers . . . The session devoted much time to data loggers, particularly on the economic justification for them.

One large company, it was reported, after studying data logging for several years concluded it really could find no economic justification for installing the equipment. However, it decided to experiment with a data-logging unit because it knew competitors had already ordered units. Company officials feared if they failed to experiment in the field now, the lack of experience might be costly 5 years down the road.

The Conoco men showed keen interest in data-logging systems now operating at Tidewater Oil Co.'s new Delaware City refinery and the system being installed at Esso Standard's Belot refinery in Cuba.

Tidewater has 12 loggers now in operation at Delaware City on process units. A thirteenth is being installed on the tank farm. A total of 5,300 points is being logged. The logging gives an hourly record and also integrates data for accounting use.

A console is used as the information center and permits reduction of the graphic control panel to a minimum. The console has a lucite table top under which a detailed flow sheet can be unrolled. A scanning feature is provided so the operator can tell when the unit is not operating as it

Clinic on automation held just recently in Ponca City brought together this panel of experts to analyze new techniques and their possibilities in refining for management of Continental Oil Co.

J. S. Hume, standing, Continental's director of technical services, was chairman of the conference.

Panelists, left to right, were:

T. R. Vick Roy, E. I. du Pont de Nemours & Co.

H. S. Stover, Beckman Instruments, Inc.

Dr. B. W. Thomas, Texas Butadiene & Chemical Co.

H. J. Noebels, Beckman Instruments, Inc.

B. W. Dempster, Fischer & Porter Co.

Warren Jackson, Standard Oil Co. (Ohio).

Jack Smith, Minneapolis-Honeywell Regulator Co.

W. G. Deutsch, Pannelit, Inc.

should. He thus can spot the beginning of an upset.

W. G. Deutsch of Pannelit reported at the Continental meeting that reliability of the data-logging systems at Delaware City has been very good so far. He said over-all utilization is 94 per cent. There were 33 failure reports in a 30-day period, but many of these failures were not attributable to the equipment.

Fischer & Porter's B. W. Dempster gave information on the Esso Be'ot logger. The system combines a pinboard program logger and an analog computer. Dempster said Esso is installing the combination because it can be used to help the operator determine the best operation of the cat cracker by way of 11 operating guides (OGJ, Dec. 31, 1956, p. 94).

Dempster took a look at what might be coming next.

"We have to build a machine that can use the optimization guide to control the unit. You might call the step 'automatic optimization,' if you are a word slinger," he said.

But Dempster said such a step depends on:

...**Making a complete analysis** of the process to be controlled.

...**Working out mathematical procedures** to give the computer complete, accurate information.

Jack Smith of Minneapolis-Honeywell Regulator told the Continental men of another planned combination of instruments. He said Esso at its Bayway tank farm will combine automatic blending with graphic portrayal of the blending operation. It also will obtain automatic sequencing by playing a punched tape back through a typewriter.

How reliable . . . H. S. Stover of Beckman Instruments reported on this aspect.

"There is no longer too much question about reliability of process data loggers," he said. "We have the hardware."

For checking error, a self-checking system can be included. This automatically checks calibration, standard cells, and alarm-circuit wiring and announces if all is well.

The ideal logger should be built so it is not a big mystery to the man working with it, Stover warned. First reaction from the process operator when a logger is installed usually is negative. To win his cooperation, he must have an understanding of what it does and how it works. It should not be a complicated monster.

Much still depends on the right man operating a logger, Deutsch declared. He cited a process supervisor for Tidewater who apparently loves to play with his data logger, experiment with it, and baby it along. As a result the supervisor is learning new ways of using the instrument that no one else has thought about. He has made the logger a success and has turned it into a valuable training aid.

One threat to data-logger reliability is the "itinerant knob twirler" or the "itinerant typewriter-key pecker." When knobs stick out on a data logger there always is some passerby who can't resist twirling the knob or another who can't resist punching keys on the typewriter into which the data tape is fed.

Investment return . . . A return on money invested in data loggers is hard to determine, another speaker reported.

The reduction in manpower made possible by a data logger is quite limited, he noted. Savings in manpower amount to only 3 to 6 per cent return after maintenance cost is figured and after taxes.

One study made a few years ago showed that purchase price of automatic data loggers ranged from $300 to $600 per recorded point.

The smaller control board and control house needed compared to that of conventional instrumentation can amount to a saving of between 20 and 25 per cent of the over-all cost of the data-logging system.

However, it was noted that there are many intangible benefits which may not be reflected in actual profit from the instrument. For instance: Human logging errors can be eliminated. The operator may be freed

from routine data recording and be more alert for upsets. Good records can be maintained during an upset while the operator is busy. All variables are logged at about the same point in time. Logging is performed at shorter intervals providing more detailed data for technical studies.

Lacking a firm financial return, most data loggers have been bought on faith alone for experimental purposes and because of competition.

What now? . . . Computer-controllers which operate a plant won't take their place in processing over night.

There has been much talk about the "managerial computer" which will digest plant process data and sales data and immediately spew out answers by which management can make decisions quickly. Ultimately the magic gadget would be tied in to control the plant according to results of its computation.

The Continental sessions learned that this development is not just around the corner, as some think.

This will take time—change will come step by step. One sign of progress in this direction is the data logger itself. Reliable instruments are now available where 5 years ago there were none. But the delay now will be in working out the mathematical techniques required. The computer-controller must be given complete, accurate information. It cannot think for itself.

This is the real frontier: Find new types of engineers needed for this work, the engineer-mathematician or the process-electronics engineer.

There are intermediate benefits to be obtained from data logging and analog simulation while this evolution in automation is taking place.

Tools now available can help the operator run his unit more efficiently, squeeze a few per cent more profits out of the operation, or analyze behavior of units and processes for better control.

One of these tools is the analog computer which can simulate operations by means of electronic circuits. This makes it a tool of considerable help in analyzing units and process behavior. It can be used now.

Also instead of setting up a pilot plant and operating it under different conditions to obtain a set of data, electrical circuits can be set up to do the same job. This would represent savings in both time and money.

Warren Jackson of Standard Oil Co. of Ohio explained the use of the analog computer for analyzing existing processes and control system. He specifically cited how the technique helps his company improve control of the refinery water-treating system (OGJ, July 8, p. 121).

A word on stream analyzers . . . Dr. B. W. Thomas of Texas Butadiene & Chemical Co. and H. J. Noebels of Beckman Instruments covered the field of stream-analyzer controllers.

The stream analyzer with the greatest potential for plant work is the gas chromatograph, it was agreed. This is the biggest single tool—old in principle, new in application—for stream-analysis control. It is being pushed rapidly and will soon take over control functions in refinery, chemical plant, and natural-gasoline plants.

For some specific applications, Dr. Thomas said, the infrared analyzer may still be superior. But none of the existing stream-analysis methods can come up to the versatility of gas chromatography.

Continental technical men left the meeting feeling that these tools of advanced instrumentation would have a big influence on refining and chemical-plant operations of the future. They agreed that much work remained to be done in determining their proper application.

First Computer-Run Unit

. . . is planned by Texaco within a year for Port Arthur refinery. System will control a polymerization process.

THE TEXAS CO. has taken a step toward the fabled push-button refinery. It has purchased the first digital computer for fully automatic control of a petroleum refining process.

Vice President J. S. Worden in charge of Texaco's refining department announced the decision last week. He said Texaco purchased the RW-300 computer developed and manufactured by Ramo-Wooldridge Corp., Los Angeles.

The unit will be installed within a year on a polymerization unit at Texaco's Port Arthur, Tex., refinery.

Worden said the RW-300 is the first digital computer engineered specifically for automatic control of industrial processes such as oil refining. He added it also is the first such machine which can be connected directly to conventional process instruments and controllers (OGJ, Sept. 2, p. 151).

Significance . . . The Texaco action pointed up the intense interest among refiners over the nation in automatic controls (see related story, p. 72).

Texaco's step takes on an added significance, however. The computer will:

. . . Control a noncritical unit. By installing the RW-300 on a polymerization unit, Texaco engineers will have plenty of working room. They can experiment with the equipment and test it thoroughly without creating too much plant upset.

. . . Give valuable new information. Automation is still a wide-open field. Much is yet to be learned. Thus, one of the biggest profits expected from the computer will be the experience and information it will give Texaco.

. . . Put Texaco in good position in the automation race. Other refiners are installing various types of computers, data loggers, stream analyzers, etc., to perform certain functions automatically. They, too, can be expected soon to take the next step of putting a full process under automatic controls.

It's all a part of the slowly developing automation picture. Oil refiners are moving cautiously a step at a time. They figure present experiments and cost of equipment will have a long-range payout.

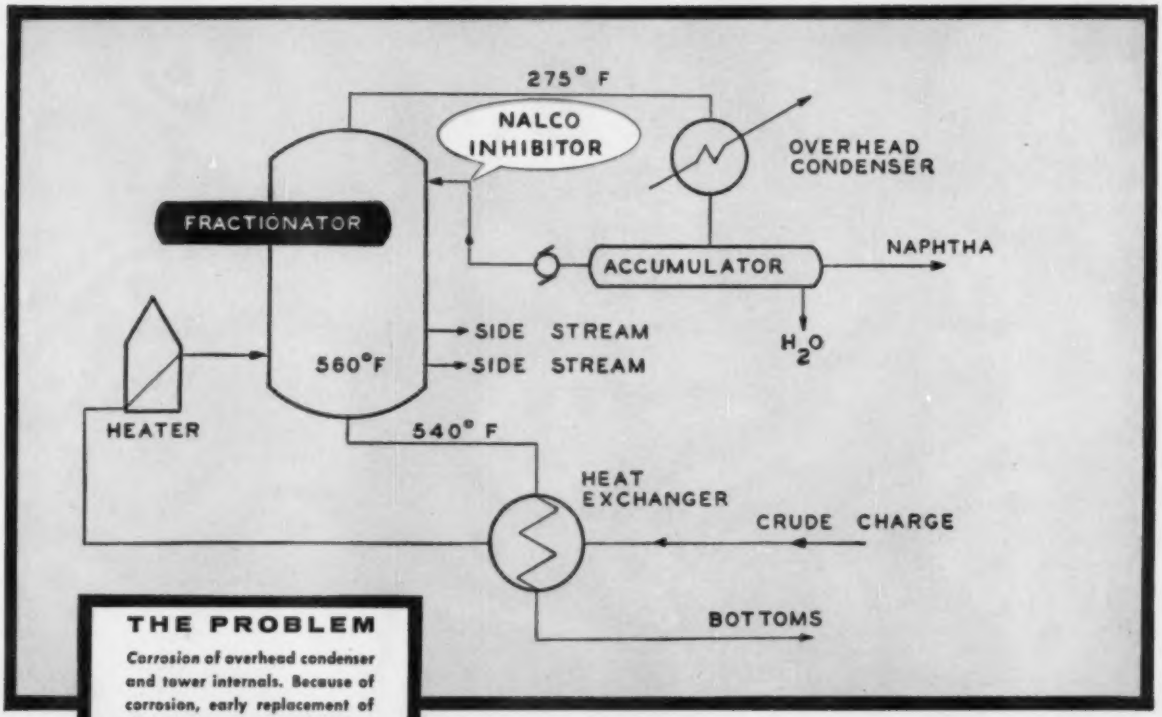
The outlook . . . In announcing purchase of the computer, Worden made two specific points:

. . . Immediate benefits. "With this unique computer," Worden said, "we are assured a new degree of automatic control in Texaco's petroleum refining operations. We are confident that RW-300 will offer us increased plant output, greater quality control, and reduced operating costs."

. . . Effect on labor. Installation of the digital computer will not reduce the number of employes required to operate the polymerization unit, Worden emphasized.

The RW-300 is expected to increase the efficiency and yield of the poly unit. The computer will continuously monitor more than a hundred variables. Converted into digital form, this information is analyzed automatically and best operating conditions determined. The computer then will transmit electrical signals which will automatically adjust valves and set points of conventional controllers. The computer in addition will simultaneously produce printed, up-to-date records of operating data.

HOW *Nalco* INHIBITORS CUT DOWNTIME 74% ... AND SAVED THIS FRACTIONATING TOWER



THE PROBLEM

Corrosion of overhead condenser and tower internals. Because of corrosion, early replacement of the tower was contemplated.

THE TREATMENT

Nalco Corrosion and Fouling Inhibitor applied into overhead reflux.

THE RESULT

In this case only one point of application protected both fractionator and overhead equipment. Iron in accumulator water brought below 0.5 ppm as compared to previous 100-150 ppm. Corrosion and plugging stopped, tower saved, and downtime for cleaning reduced by 74%.

EFFECTIVE Nalco corrosion control is very low-cost protection. For example, this refinery not only avoided the cost of a new tower, but cleaner tower internals actually resulted in better fractionation and higher quality products. If you would like further facts on Nalco Corrosion and Fouling Inhibitors, ask your Nalco Representative or write direct.

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But not these Crane valves. Installed in 1944, they have required no maintenance beyond routine repacking of the stuffing boxes!

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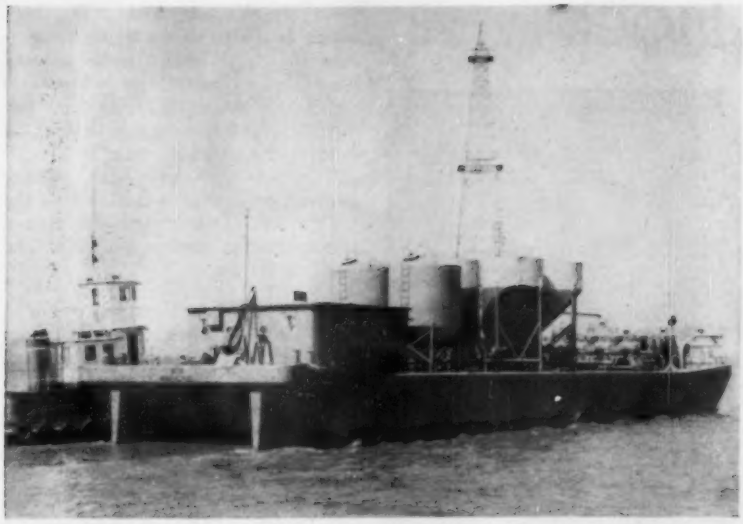

The Halliburton 808 sails for Maracaibo. It's the . . .

First Fracturing Barge Built

HALLIBURTON Oil Well Cementing Co. has built the world's first oil well fracturing barge, now enroute to Venezuela's Lake Maracaibo.

The 130-ft. craft, Halliburton 808, is the first ever designed from the keel up for the specific purpose of fracturing wells. Fracturing equipment has been installed on some old barges in the past.

The new barge is being towed to Maracaibo from New Orleans for use by Cia. Halliburton de Cementacion y Fomento, Venezuelan subsidiary of Halliburton.

Built by Higgins, Inc., at its New Orleans shipyard, the barge carries four Howco T-10 pumps, each powered by a 600-hp. diesel engine, a sand proportioner for mixing fracturing fluids and sand, and a chemical agitator. Fracturing equipment, control consoles, and storage for chemicals and 3,850 sacks of sand are located on deck.

Storage for 4,000 bbl. of fracturing fluid, 6,000 bbl. of fresh water, and 15,800 gal. of diesel fuel is below deck. The deckhouse has air-conditioned living quarters and a galley.

The new barge can perform two 1,500-sack fracturing treatments before returning to base.

Fracturing and most auxiliary equipment for the barge was manufactured at Halliburton's Duncan, Okla., plants and mounted on the barge at the Harvey Canal docks across the Mississippi River from New Orleans.

At Maracaibo, well fracturing first was applied in 1954 by Halliburton. More than 200 wells have been treated, and producers plan bigger fracturing programs for water locations. In the past lake wells have been fractured with trucks carried on barges.

Deep Test Fails

in West Texas, but Phillips is trying another nearby.

THE WORLD'S second deepest hole has been plugged and abandoned at 21,687 ft. in West Texas, but another well, 7 miles away, is below 20,400 ft. and still drilling.

Pan American Petroleum Corp. has given up on its 1-CS University deep wildcat 13 miles southeast of Fort Stockton in central Pecos County.

The well bettered the former Texas depth record by almost 2,600 ft. The world's deepest hole was drilled to 22,570 ft. in South Louisiana by Richardson & Bass and others.

Pam Am quit drilling at the 1-CS University when drill pipe parted. It was short of its Devonian objective.

Seven miles north of the location Phillips Petroleum Co. was down to 20,400 ft. last week with its 1-EE University. Phillips has a tentative depth limit of 21,000 ft. The well has found the Ellenburger, its objective, and is looking for porosity in the formation.

A Phillips spokesman said the well is making 40 ft. a day and is in "good shape." It has about 9,500 ft. of open hole. The only show so far has been at 8,700 ft.

——Industry briefs

Directors of Humble Oil & Refining Co. will not immediately name a new chairman of the board to succeed the late J. A. Neath.

A letter distributed among employes of Humble and its subsidiary, Humble Pipe Line Co., indicated that activities formerly performed by the board chairman will be assigned to other members of the board. The letter was signed by Morgan J. Davis and A. E. Pecore, respective presidents of the two companies.

Neath, who had been chairman of the board since 1955, died in mid-November.

Directors of Climax Molybdenum Co. and American Metal Co., Ltd., have voted to merge their companies if stockholders vote approval at a special meeting December 30. The two companies have oil and gas holdings and are joint participants in some oil and gas ventures.

Climax' interest in production averaged 2,500 bbl. per day during the first 6 months of this year. Production is in Texas, Kansas, Oklahoma, and Kentucky. American Metal's oil production interest averaged 551 bbl. per day.

Morgenstern Oil Operations, Wichita, Kans., has paid approximately $250,000 for 30 producing oil wells in Barton, Kingman, and Stafford counties, Kansas. The seller is Diversified Oil & Mining Corp. of Denver. The wells are rated at a combined total of about 140 bbl. daily. Reserves are about 300,000 bbl.

Merger of Tidelands Oil Corp. into Commonwealth Oil Co. has been approved by directors of the two companies. The merger plan, to be submitted to stockholders this week, would involve the issuance of one share of Commonwealth stock for nine shares of Tidelands. Tidelands, organized as a subsidiary of Salt Dome Oil Corp. 10 years ago, has oil reserves in Jackson County, Texas, estimated at about 375,000 bbl. Commonwealth is a Florida firm with operating headquarters in Houston.

Esso Research & Engineering Co. has moved its executive offices from New York to Linden, N. J. Thirty top executives and administrative personnel transferred to the site of the company's 56-acre Esso Research Center, where 3,000 persons are employed. Some 40 other headquarters employes moved to Linden earlier this year.

Simpson to Head IOCC in '58

HARRIS BILL PASSAGE is uppermost in the mind of Wyoming Gov. Milward L. Simpson, as the new chairman of the Interstate Oil Compact Commission.

To reach his objective, he plans to step up the activity of the Compact and drive for more participation by oil-state governors.

"Working together," he says, "we can offset the type of thing which stems from the Supreme Court decision in the Phillips case."

Simpson takes over as 1958 chairman of the Compact from Gov. Raymond Gary of Oklahoma, who as chairman this year urged the governors to fight excessive imports.

Simpson's election came at the annual meeting of the Compact in Tulsa last week. Registration was more than 550, by far the largest attendance at any compact meeting. Governors from eight states attended, and representatives of most of the other oil states were on hand.

Simpson says he concurs in the voluntary program which is designed to limit imports into this country. But he says it has to be voluntary, and not mandatory, except in the case of all-out emergency.

"The question of imports is so indelibly linked with national security," he said, "that we must be realistic about it."

He said we are already confronted with an emergency, because of the psychological advantage which the sputniks gave Russia, and because of Russia's rapid strides in the field of technical education and science.

GOV. MILWARD L. SIMPSON
. . . a working oil governor.

Other officers elected at the Compact meeting include Jake Jacobsen, administrative assistant to Texas Gov. Price Daniel, named first vice chairman, and James C. Hamill, personal attorney for Governor Gary of Oklahoma, elected second vice chairman. Both men are official representatives to the Compact from their respective states.

First Polypropylene Plant

. . . in North America put on stream at Parlin, N. J., by Hercules Powder, which holds bright hope for new plastic.

THE HIGHLY competitive plastics field will have a new petrochemical entry soon in polypropylene. This significant new plastic will hit the market at an introductory price of 65 cents a pound.

The material will come from the world's largest commercial polypropylene plant put on stream last week at Parlin, N. J., by Hercules Powder Co.

The Parlin plant is the first commercial polypropylene producer in North America. It will have an annual capacity of 20,000,000 lb.

Hercules will market its product under the label of Pro-fax. Officials report the initial price will be lowered eventually when benefits of large-scale operations are brought to bear. Then it will be fully competitive with other plastic materials.

Hot race . . . Several companies have been engaged in a race to get the first commercial polypropylene plant into production.

Research teams of a number of companies have been working hard on the development. But chief contenders have been Hercules and the Italian Montecatini interests. Montecatini has completed its plant and is willing to deliver polypropylene in the United States.

Polypropylene is made from petroleum-derived propylene. High-purity propylene for the process is being supplied by Sinclair Chemicals, Inc., which is completing a plant to separate the light olefin from refinery gases at the nearby Marcus Hook refinery of Sinclair Refining Co. The Sinclair plant also is the first of its kind in the nation.

The high-purity propylene required in the process also is available on the Gulf Coast. That makes this area a prime site for another polypropylene plant in the future.

What it is . . . Hercules claims a wide range of outstanding properties for plastics made from polypropylene.

The material reportedly has a lower specific gravity than other commercial plastics. It also has higher tensile strength, hardness, temperature resistance, stiffness, resilience, and clarity.

Its backers expect a wide range of applications for polypropylene. It may complement the usefulness of high-density polyethylene and broaden the available markets for plastics, especially those served by wood and metal.

Hercules also claims the material is resistant to grease and oil, water, and many common acids, has outstanding electrical properties, and high impact strength. With outstanding heat resistance, polypropylene may become a new material for plastic pipe.

Unit Recovery Plan

may double crude output in Garvin County field.

PHILLIPS Petroleum Co. will start water-injection operations early in 1958 on a newly formed production unit in Garvin County, Oklahoma. The unit owners hope eventually to double recovery of oil from the 6,640-acre area.

Operations for the Panther Creek-Hart Sand Unit began December 1, and water injection will start first on 2,000 acres. The entire unit has 166 wells.

Phillips, the operator, owns 43.3 per cent of the Panther Creek Unit. Other large-interest owners include Continental Oil Co., Magnolia Petroleum Co., Carter Oil Co., Pan American Petroleum Corp., Sun Oil Co., Cities Service Oil Co., and Superior Oil Co.

The Oklahoma Corporation Commission approved the unitization plan September 27.

Phillips' district production office at Pauls Valley will supervise the unit. The office will be moved to a new location at Pauls Valley to accommodate increased personnel.

PARKERSBURG bolted steel tanks

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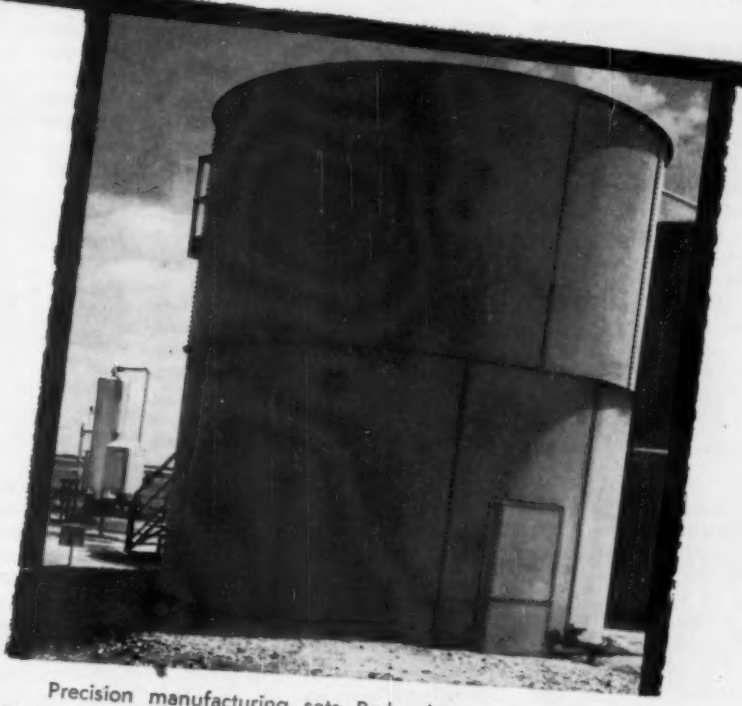
top value
and
low cost...



Precision manufacturing sets Parkersburg Bolted Steel Tanks apart from all others in the field. On leases everywhere a Parkersburg Bolted Steel Tank battery is the symbol of efficient, low-cost production storage. Parkersburg Bolted Steel Tanks are better because they are made right. Every part is cut, formed and punched by machinery. Bolt holes in side and deck sheets are die-punched in a single operation. Then, too, Parkersburg tank packing, made exclusively for Parkersburg, has proved superior in test after test. For quality, for value and low cost, specify a Parkersburg Bolted Steel Tank.

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LPG Pilot Flood Turns Up New Clues

Carter sheds more light on channeling, crestal floods, and watered-out formations. Radioactive tracers help measure efficiency. Core holes will be drilled to find out how much oil is left after a propane flood.

CARTER OIL CO. is coming up with some important conclusions in its 5-year program to find the best way to coax more oil out of the ground through the use of LPG.

Results of laboratory tests and field tests on the company's C-2 leases in Seminole County, Oklahoma, show:

... **Severe channeling** has not taken place so far, and 2 bbl. of oil have been produced for each barrel of propane produced.

... **Formations with significant dip** promise to be much more adaptable to LPG flooding than flat-lying formations.

... **Watered-out reservoirs** shouldn't be ruled out as possible candidates for LPG flooding.

Field results . . . Recent tests at Carter's C-2 Block leases, which have been producing since 1929, have indicated that substantial amounts of oil can be recovered by the gas-driven solvent bank process at modest propane-oil and gas-oil ratios.

Carter began a study of the Booch sand in the pilot area in 1952. In addition to the five producing wells, the company drilled two gas and LPG-input wells and two water-input wells to set up a water barrier across the north end of the test area.

After the LPG flood was started, daily production rate increased from about 13 bbl. per day to more than 200 bbl. daily early in 1954. Since then it has dropped steadily to a present rate of 34 bbl. of oil daily.

State proration restricted production for about a year following the initial response, but total oil production to October 1957 has been 140,000 bbl. This parallels a gas production of 535,000 M.c.f. and a propane production of 71,400 bbl.—or 50 per cent of the injected volume.

Carter's next move will be to drill several core holes in the test area to find out how much oil is left after flooding, and to obtain data on section and areal sweep. In addition, the final phases of the test operation should give valuable information on reservoir volume.

Last year the company began using radioactive tracers, which Carter says should shed considerable light on the degree of channeling and should help evaluate the efficiency of the process.

In the tracing program, four curies of krypton 85 were injected into the G-1 Wisner well, and two curies of tritiated methane into the G-1 Sanford. Periodic samples are taken at the producing wells and an accurate low-level radioactive count is made on these samples.

Generally, shortly after the radioactive material appears at the producing well the radioactive count increases and the curve passes through a maximum and then falls off after the bank of radioactivity is past.

Carter says this radioactive tracing program is one of the first real quantitative efforts of this type in the producing end of the oil industry.

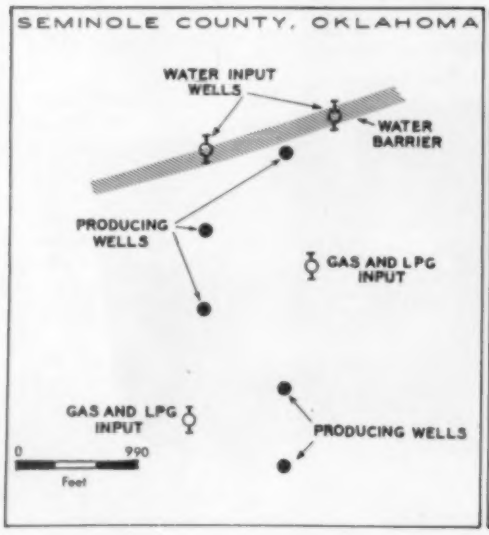
Crestal flood best . . . Lab tests showed a distinct difference between vertical and horizontal solvent floods.

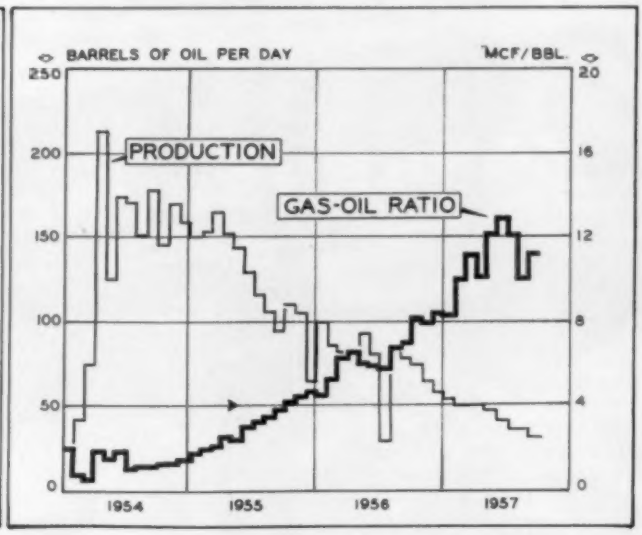
Because of the influence of gravity, flooding in the vertical direction is more efficient than in a horizontal injection. A vertical lab test showed recovery of 10 per cent more oil.

This situation could be far more striking in the field, where it is possible that poor volumetric coverage (or low conformance) may have an adverse effect on the horizontal flood and perhaps very little effect on the vertical, thus pointing up the beauty of crestal injection.

Carter pointed out that it may very well turn out that for more efficient operation of solvent processes involving adverse mobility ratios the production people may prefer to seek fields with significant dip.

Carter's LPG test pattern ... And its results from the flood





After water floods . . . Carter researchers have applied the gas-driven solvent bank process to watered-out models. In one case, of the 39 per cent pore-volume oil remaining after a water flood, approximately one-half of it was removed as a result of the solvent-extraction process.

Although it is not always practical, it would be better not to water flood prior to using LPG to recover oil from a reservoir, Carter research men say.

But it was pointed out that there are many likely candidates for solvent flooding among pools already watered out, and it might still prove financially attractive to apply the gas-driven solvent process to some of these pools.

More research needed . . . Carter presented its report on LPG flooding at the annual meeting of the Interstate Oil Compact Commission in Tulsa last week.

Dr. Charles D. Russell, head of the company's production research section, told Compact delegates that conservation-minded people must see to it that necessary research and engineering development is undertaken in the field of solvents to assure proper development of the nation's oil reserves.

He said that although the industry has advanced considerably in basic lab and theoretical work, a good deal of costly field testing is needed to determine where solvent extraction processes would work the best.

Small Refinery to Be Closed

COSDEN PETROLEUM CORP. will shut down its 7,000-bbl. Hawley refinery near Abilene within the next 30 days.

R. L. Tollett, Cosden president, said the company decided to close the plant when the Government whacked in half its planned purchases of aviation gasoline from the main company refinery at Big Spring, Tex. The purchase cutback will take effect January 1.

Tollett said Cosden will continue to operate the loading facilities at Hawley and will maintain the plant on a standby basis. He hinted that the plant would resume operations within a year if gasoline-demand improves sufficiently. Otherwise, he said, Cosden will consider converting the plant to petrochemicals manufacturing.

Cosden acquired the Hawley plant when it bought out Onyx Refining Co. October 1, 1956.

Pipeline briefs

Laurel Pipe Line Co. has awarded a contract for construction of the Susquehanna River crossing to Pipe Line Maintenance & Construction Co., Camp Hill, Pa. This is the first contract let on the 440-mile, 24 to 14-in. products line which will be built from Philadelphia to Cleveland next year. Laurel is owned by Gulf Refining Co., Sinclair Pipe Line Co., and The Texas Co.

Engineers Limited Pipeline Co., San Francisco, has been awarded a contract to build an 82-mile, 34-in. natural-gas line for Pacific Lighting Gas Supply Co. from North Coles Levee in south-central San Joaquin Valley to Newhall in Los Angeles County. The line will cost about $12 million. The contractor plans to put one spread to work around the first of the year at the North Coles Levee end.

Northwestern Utilities, Ltd., has received permission from Alberta to build a 72-mile, 16-in. line from Pembina field to Edmonton. The $3,500,000 project is to be completed in time for the heating season next fall. Initial throughput will be 65,000 M.c.f. daily.

Alberta & Southern Gas Co., which has contracted for 80 per cent of Pembina's gas, plans to build a 1,300-mile line from Alberta to San Francisco. Northwestern Utilities has contracted with Alberta & Southern, an affiliate, for gas for the Edmonton line. Provincial approval prohibits the export of Pembina gas.

Jupiter Oils, Ltd., and Kroy Oils, Ltd., have purchased controlling interest in Edmonton Pipe Line Co., Ltd., which serves Joarcam oil field located 15 miles southeast of Edmonton. The purchase of 200,000 shares from Conick Petroleums gave the companies 300,000 shares or 60 per cent interest in Edmonton Pipe Line. The remaining 40 per cent is held by New Superior Oils of Canada, Ltd., and General Petroleums of Canada, Ltd. Earl S. Killian, New York, of Jupiter Oils has been named president of the pipeline company. Expansion plans will be announced later.

California Pipeline Co., subsidiary of The California Co., is being absorbed by the parent company in Wyoming. The pipeline company has applied to the Wyoming Public Service Commission for authority to sell its 20-mile crude line from Quealy Dome field to Rock River and its 50 per cent interest in a 7½-mile line from Medicine Bow field to Medicine Bow. Calco wants to continue operating the lines as common carriers.

Pacific Northwest Pipeline Corp. plans a 40-mile line from Ute Trail gas fields in northeastern Utah to its main line in western Colorado. Construction is expected to start next spring on the $2-million project. Producers which would benefit include Sun Oil Co., Continental Oil Co., Havenstrite Oil Co., and General Petroleum Corp. This would be the first major gas line from the Uintah basin.

Texas Eastern Transmission Corp. has temporary authority to build another 59 miles of 30-in. loop along its main line from Kosciusko, Miss., to Uniontown, Pa. The company told the FPC it would save $1,954,000 by constructing the line as a continuation of loops already approved. This $5,890,000 project would increase capacity of the line by 20,000 M.c.f. daily. It's part of an expansion to increase capacity by 102,000 M.c.f. daily.

Also for Pipeliners . . .

IN THE NEWS: Construction costs will be high on final sections of Trans-Canada (p. 65) . . . California buyers' bids for Four Corners crude may hurt prospects of Texas-New Mexico pipeline (p. 66) . . . Four Alberta independents are backing new crude line to Montreal (p. 68) . . . FPC seeks review of court decision giving customers stranglehold over gas rates (p. 70) . . . Muskegon Pipe Line completes new crude line in Michigan (p. 83) . . . Sahara crude line will be started next year (p. 86) . . . Shell is pushing its heated crude line to handle Boscan oil (p. 88).

PLUS THESE TECHNICAL REPORTS: Natural Gas Pipeline Co. uses three kinds of pipe protection (p. 98) . . . Pipeline construction report (p. 143).

It's largest polyethylene unit in world when . . .

Grace Puts Plant On Stream

W. R. GRACE & CO. has completed 2-week shakedown runs on its new polyethylene plant at Baton Rouge, La., and is starting up commercial production.

The high-density polyethylene will appear on the market soon under the trademark of GREX.

Grace's new plant has capacity of 50,000,000 lb. per year and is the largest of its kind in the world. Fluor Corp., Ltd., built the facilities in less than 15 months at a cost of $18 million. The low-pressure Phillips process is being used.

Grace took an unusual move in getting its plant into production. It trucked its ethylene feed stock to the new plant in a fleet of tank trucks from East Texas.

Grace eventually will charge ethylene produced at Esso Standard Oil Co.'s plant 4 miles away. But Esso's facilities have not been completed. So until this feed is available, the high-pressure tank trailers will be used. The ethylene is stored underground in facilities built by Esso, assuring a steady supply during the interim period.

High-purity catalyst needed for the polyethylene process is supplied by a Grace subsidiary, Davison Chemical Co. Davison is working on new catalysts for improved polyethylene and the newer polypropylene processes now under development.

Maximum use of aluminum also features the new Grace plant. The first all-welded aluminum dryers ever built—two horizontal units 5 ft. in diameter and 55 ft. long—dry the polymer in an oxygen-free atmosphere. Aluminum piping and sheathing are used in many cases throughout the plant.

Grace emphasized safety in building the plant. In the graphic panel control rooms if an operator pushes the wrong button, a foolproof interlock system catches the error automatically before the process step is carried out. Thus quality of product is assured.

A sprinkler system is intricately patterned so that each section can be deluged with water in a matter of seconds from control rooms or near the location of vessels. Inert gas is used to render hydrocarbon-filled atmosphere explosionproof. Elaborate safeguards also have been installed to eliminate polymer "freezing or setup" in the complex network of pipelines during process interruption.

Rich Payoff Seen

for Hermosa Beach in deal to drill city's tidelands.

THE CITY COUNCIL of Hermosa Beach on the southern California coast has signed two contracts with oil companies through which the city hopes to net $70 million over the next 35 years.

One contract gives Shell Oil Co. and Continental Oil Co. joint drilling rights to the city's 2-mile long tidelands.

The other gives Bandini Oil Co. the right to slant drill from city property to reach onshore leases it has signed with private property owners within the city limits. Bandini paid $10,000 for the city-owned drill sites.

Both contracts are contingent on outcome of an election February 25. Citizens will decide then whether to lift a 1929 ban on drilling in the city. The oil companies will pay for the election.

The Shell-Continental contract with the city calls for a series of bonus payments. They include:

. . . **$405,000** paid when the contracts were signed.

. . . **$8,600,000** for 35-year drilling rights to be paid when and if the present drilling ban is repealed.

. . . **$94,340** for use of city streets in drilling operations. This also was paid when contracts were signed.

. . . **$2 million plus $100,000 yearly** for 35 years for use of certain city property as bases of operations and for pipeline franchises within the city limits. This bonus also is contingent on the February 25 election.

Besides all this, royalty provisions call for a sliding scale beginning at 18 per cent or a guaranteed $250,000 per year whichever is greater.

Dresser Merger Is Off

THE PLANNED MERGER of Dresser Industries, Inc., and Gardner-Denver Co. was called off last week because of what Dresser executives termed "differences in management philosophy" which could not be reconciled.

H. N. Mallon, Dresser chairman, said Dresser's growth has been due in a large part to an operating philosophy which stresses decentralized management, with the individual companies having major responsibility for policies. Gardner-Denver, he said, favored centralizing authority in a large headquarters.

Mallon said the end of the nego-

tiations will have no effect on Dresser's intention to further diversify its activities. It is looking particularly at the mining and construction industries, he said.

Crude Line Finished

by Muskegon Pipe Line to serve refiners in Michigan.

CRUDE OIL has started flowing through the 166-mile, 10-in. line of Muskegon Pipe Line Corp. from Griffith, Ind., to Muskegon, Mich.

The 26,000-bbl. daily line, with one pump station at Griffith, was built by Service Pipe Line Co., joint owner of Muskegon Pipe Line with Aurora Gasoline Corp. Muskegon will take oil from the Service system at Griffith and move it to plants of Aurora and Naph-Sol Refining Co., formerly served by lake tanker from Chicago.

The line will give these two competitors of Service's parent company, Standard Oil Co. (Ind.), the benefits of low-cost, dependable transportation of crude types suited to their requirements. Service, which had available space on its system from the Rockies and Southwest, will receive added revenue from the long-haul business to Griffith.

The first 50 miles of the line was tested with water to 1,500 psi. To avoid the danger of freezing, the remainder was tested with oil.

Muskegon's route skirts the congested Chicago industrial area, crosses numerous highways and railroads, and traverses swamps east of Muskegon. Midwestern Constructors, Inc., Tulsa, had the contract for the project.

Union Asks Raise in Canada

THE OIL, Chemical, and Atomic Workers International Union is demanding for its Canadian members a 1958 wage increase of 8 per cent and a minimum increase of 18 cents an hour.

The union also has set bargaining goals of 30 cents an hour above regular wage for Sunday work, double time for overtime, shift differentials of 8 cents and 16 cents, and 3 weeks' vacation after 8 years of service. The 1958 bargaining policy was proposed recently by a conference of OCAW oil locals in Regina.

In the United States, there has been no indication of 1958 contract demands. Current OCAW studies of a possible shorter work week have delayed the customary fall meeting of the bargaining policy committee until early next year.

Imports Hurting Conservation

. . . Compact declares in resolution. Committee concludes they're to blame for low allowables, lagging oil activity.

OIL CONSERVATIONISTS last week warned that excessive imports could destroy conservation at the state level.

The Interstate Oil Compact Commission, at its annual meeting in Tulsa last week, topped off a 6-month study on imports by adopting a resolution saying state conservation programs "are now being adversely affected by excessive oil importation."

The resolution was based on a lengthly report by a special 11-man committee appointed earlier this year.

The committee, headed by W. A. Delaney, Jr., independent operator from Ada, Okla., blamed excessive imports for curtailment of production and exploration, pipeline proration, lagging pipeline expansion, and a slowup in secondary-recovery operations.

The committee charged that unrestrained imports enable the larger integrated companies to promote monopoly controls, "thereby removing the competitive elements which assure adequate resources at reasonable prices."

The committee report said the U. S. is "not running out of oil," but added that "if imports are not effectively limited, the domestic industry will be rendered soon incapable of fulfilling its obligation to the security and economy of the country.

In making his committee's report to the Compact, Delaney commended the voluntary imports-control program, but pointed out that "at least three substantial importers have seen fit to ignore recommendations."

He said it's anybody's guess as to how long the importing companies which are now complying with the program will continue to do so, and added that "a strong and stable domestic industry cannot be predicated on a purely voluntary program of this character."

Harris bill . . . In another resolution, the Compact urged support of the Harris-O'Hara gas bill to "afford to independent natural-gas producers escape from bureaucratic control."

The proposed legislation was described as "not all that we, as supporters of the theory of states rights, would desire. Yet, it is a step in the right direction, and should be supported aggressively by member states."

EFFECT OF IMPORTS on conservation took the spotlight at the Interstate Oil Compact Commission's annual meeting in Tulsa last week. Left to right are W. A. Delaney, Jr., independent operator, who headed a special study on imports; Oklahoma's Gov. Raymond Gary, who as Compact chairman this year spearheaded a drive against excessive imports; and Capt. M. V. Carson, Jr., administrator of the voluntary imports-control program.

New Imports Policies

. . . will be considered by cabinet committee in reviewing its basic approach to imports control in 2 or 3 months.

THE BASIC PATTERN of the imports-control program will come up for review by the cabinet committee within the next 2 or 3 months.

And when it does, the committee likely will be asked to make major changes in the program.

The committee will, for example, hear proposals to:

Give importing companies credit for the crude they export: exempt asphaltic crudes needed for the highway program; and base the entire control program on refinery demand rather than historical imports.

These ideas, and possibly more, will probably be on the agenda for the committee meeting in February or March, Capt. M. V. Carson, administrator of the program, indicated last week.

Credit for exports . . . Under the current control program, exports are not considered in determining import quotas. In July and August exports of U. S. crude averaged about 28,500 bbl. daily.

Sun Oil Co., one of the few importing companies not fully complying wth the voluntary program limiting imports, is currently exporting about 19,000 bbl. of U. S. oil per day to Canada.

Sun imported 60,000 bbl. daily of foreign oil in October. This is 9,600 bbl. more than was allocated. If the 19,000-bbl. export figure were subtracted from the 60,000-bbl. import figure, the net would have been 41,000 bbl. per day—well under Sun's 50,400-bbl. quota.

The company plans to cut imports to 52,400 bbl. daily by March, but this is still 2,000 bbl. per day more than the voluntary limitation.

Asphaltic crudes . . . Some companies have pointed out that the federal highway program will increase the demand for asphalt when it gets in full swing, and they think the big demand might result in a shortage of asphalt.

Asphalt demand in the U. S. has increased steadily during the past 10 years, from 119,000 bbl. per day in 1946 to 250,000 bbl. per day in 1956.

Import schedules filed with the Texas Railroad Commission in October show that Standard Oil Co. of Indiana planned to import 27,000 bbl. of asphaltic crude per day; Cities Service Co., 8,000 bbl. daily; and Socony Mobil Oil Co., Inc., 3,300 bbl. per day. This low-gravity crude comes from Venezuela and Mexico.

New control basis . . . Some companies are suggesting that import quotas be based on a percentage of total refinery demand.

They propose that inland refiners be given allocations which they could transfer to plants which normally process foreign crude. Some suggestions include allocations to refiners not now importing oil, with the privilege of either transferring the allotments to importing companies or forfeiting their importing privilege and thereby reducing total imports.

These suggestions, Carson indicated, probably will be considered by the committee.

In Tulsa last week Carson told delegates to the Interstate Compact Commission meeting that the control program is "well on the way toward success."

The 4-month-old program, he said, has cut imports east of the Rockies from 966,000 bbl. daily in August to 767,000 bbl. in October. Several refineries on the East Coast, he said, "are now using domestic crude for the first time in recent years. Also, several companies have doubled the quantity of domestic crude which they used" a few months earlier.

New barge makes history on the Atlantic with long-distance haul as . . .

Butadiene Exported for the First Time

GOODRICH-GULF Chemical Co.'s shipment of butadiene to Ravenna, Italy, is the first butadiene of any consequence to be exported from the United States, according to Goodrich-Gulf President W. I. Burt.

The long-haul shipment is now en route on a new barge (photo) from Port Neches, Tex., to the Adriatic city, where it will be used for making synthetic rubber (OGJ, Dec. 2, p. 61).

The barge, Puerto La Cruz, was built by Bethlehem Steel Co.'s shipbuilding division at Beaumont for Warren Petroleum Corp. for use in transporting butadiene and other chemicals on long ocean hauls.

Burt said he believes the current shipment represents the first time that butadiene, or other material requiring pressurized tanks to keep it in liquid form, has been shipped over long distances by barge. There have been some short trips from the U. S. into the Caribbean and to Venezuela.

The Warren barge, towed by a 2,000-hp. diesel tug, is transporting 830,000 gal. of butadiene for use in a Ravenna synthetic rubber plant now under construction. Eventually the plant will produce its own butadiene.

Goodrich-Gulf is a subsidiary of B. F. Goodrich Co. and Gulf Oil Corp.

Dome Yields Oil

off coast of Louisiana. Pan Am opens new deep pool at Coon Point test.

THE OLD COON POINT salt dome, scene of some of the earliest drilling in open water of the Gulf of Mexico off the Louisiana coast, proved commercially productive last week for the first time.

It's the twenty-fourth field to be opened this year in Louisiana's offshore areas, and the state's tenth field with production at depths below 16,000 ft.

The discovery well, drilled by Pan American Petroleum Corp., is being completed as a gas-condensate producer in sand at 16,830-42 ft. Testing through ⅞-in. choke, the well flowed initially at the rate of 3,500,000 cu. ft. of gas with 45 bbl. of 46.7°-gravity condensate per day. Flow pressure was 4,200 psi.

Two lower zones at 17,678-89 ft. and 17,572-84 ft. were tested unsuccessfully. Drilled to 18,005 ft., the well is South Louisiana's seventh deepest test.

Location is off the east flank of the dome, about 7 miles from the Terrebonne Parish shoreline in Block 39, Ship Shoal area.

Coon Point, a medium-depth piercement-type dome, was discovered in geophysical work by The Texas Co. Drilling dates back to 1938. Texaco's first test proved the dome by drilling into salt at 4,900 ft.

Discovery of production after so many years gives new support to the long-held belief that all salt domes eventually will prove productive.

Louisiana Calls Off Leasing

LOUISIANA has halted leasing on state-owned lands, at least for December, because of lagging interest in recent sales.

Bonuses for oil leases, normally an important factor in the state's economy, are running nearly 50 per cent behind last year.

William G. Helis, Jr., chairman of the state mineral board, said an indefinite moratorium on leasing had been approved unanimously by board members. Gov. Earl K. Long concurred in the decision.

Helis indicated the board will make a study to find out whether it should change leasing policies. The study also will cover oil imports and domestic demand as they affect state leasing.

Processing briefs

Full ownership of National Petro-Chemicals Corp. will pass to National Distillers & Chemical Corp. The purchase of Panhandle Eastern Pipe Line Co.'s 40 per cent interest in the company has been approved by directors of both companies. The price: 1,500,000 shares of National Distillers, amounting to about $31,000,000 at present market prices. The joint company was set up in 1951 to build the major petrochemical plant at Tuscola, Ill. Now a second plant to produce polyethylene is building at Houston.

Imperial Oil, Ltd., has awarded contract to Canadian Bechtel, Ltd., for the $17-million expansion program at its Calgary refinery. Construction will begin some time next spring, with completion set for the fall of 1959. The expansion, which will boost capacity 80 per cent to 14,700 bbl. daily, will include a cat cracker, Powerformer, atmospheric and vacuum distillation unit, and new treating facilities.

Creole Petroleum Corp. will build the first lube Hydrofining plant in Latin America. The 700-bbl.-daily lube plant, with all its units, will cost Creole $7,650,000. Foster Wheeler Corp. has the contract. The new units, slated for completion next year, include phenol extraction, propane dewaxing, a tank farm, and packaging equipment.

The International Air Transport Association, meeting recently in Washington, voted to accept —58° F. as the freezing point of kerosine jet fuel. The specification will be as determined by the International Petroleum test. The group also agreed to accept Pratt & Whitney's ultraviolet test as an alternate to smoke point for rating jet fuel. Decision on what specs to use for thermal stability will await development work by ASTM.

The IATA comprises most foreign-flag airlines, plus TWA, Pan American, and some other domestic lines flying foreign routes. Their decisions on specifications are not binding on most domestic airlines flying in the U. S.

Esso Standard Oil Co. boosted wholesale gasoline prices from 1 to 6 cents per gallon in several New England areas, where price wars have been in effect for some time. Increases ranged from 1 cent in Maine to 5 in Providence and 6 in Springfield, Mass.

Ethyl Corp. reduced the price of tetraethyl lead by about ½ cent per pound last week. The new postings, in terms of cents per pound of TEL content, are 60.18 cents for motor mix, 61.18 cents for motor plus, and 66.08 cents for aviation mix.

Magnolia Petroleum Co., has or-dered a giant IBM 705 computer to further speed its accounting, technical, and research programs. The huge brain, valued at $2,500,000, is scheduled for delivery in Dallas in the fall of 1959. The company will lease the computer on a permanent basis. Magnolia estimates it will require the fulltime services of 20 to 40 trained specialists to keep the 705 operating at peak efficiency.

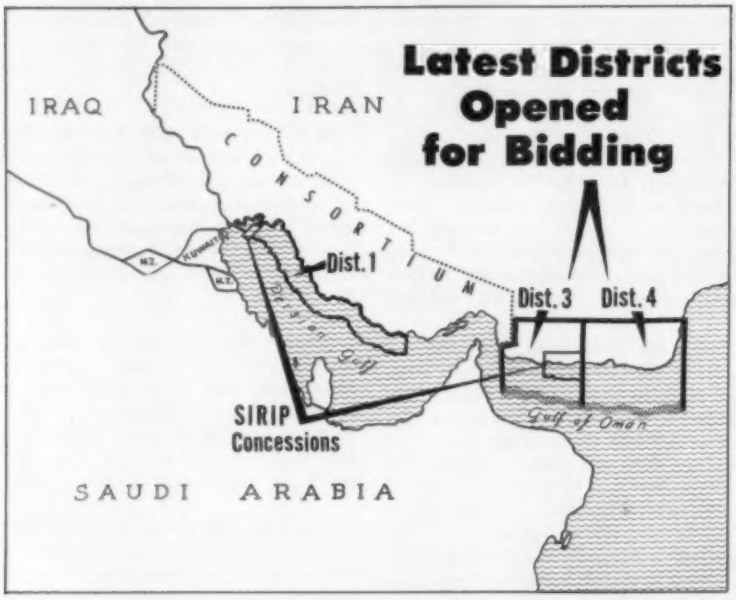
The company has four medium-sized computers already in operation. One is at the Beaumont refinery doing technical calculations, two are doing accounting work at Dallas headquarters, and the fourth is used in research work at the company's Dallas lab.

Foster Wheeler Corp. will move its New York offices to the new Tishman Building at 666 Fifth Avenue. The 1,500 employes of the engineering and construction firm will occupy five floors of the 38-story building. Executive offices are at 165 Broadway, while the drafting and engineering departments are located elsewhere in Manhattan.

Also for Refiners . . .

IN THE NEWS: Two California refiners ask Navy to relieve them of contract to buy Elk Hills crude (p. 68) . . . Average octanes for premium gasoline hit 1957 high of 98.4 in November (p. 71) . . . Special panel advises Continental Oil management push-button refining is still down the road (p. 72) . . . Texaco to install first computer-operated unit at Port Arthur refinery (p. 74) . . . Hercules Powder puts first polypropylene plant on stream (p. 78) . . . Grace begins operating polyethylene plant (p. 82).

PLUS THESE TECHNICAL REPORTS: Some tips on cooling-tower water treatment (p. 91) . . . Controlling catalyst erosion in cat crackers (p. 101) . . . Dehydrogenation in making butadiene uses fixed-bed methods (p. 114).



Iran Plans More Leasing

. . . as two new concession districts are opened. Some of the area will be off the southern coast in the Persian Gulf. Bids will be received until May 1.

IRAN last week added another pair of spurs to the widely expected increase in offshore drilling in the Middle East.

The Iranians announced two more new petroleum districts open for bidding under the terms of Iran's new oil law. The first district was announced a month ago. It consisted entirely of underwater areas claimed by Iran off her west coast in the Persian Gulf (OGJ, Nov. 11, p. 131).

Like the first district, the two announced last week have large underwater areas. This is almost certainly the result of preferences already indicated by prospective bidders. The two new areas are Districts 3 and 4. Just what happened to District 2 was not explained.

The new open areas are adjoining. Each includes land areas on Iran's south coast. Each also consists of large tracts of the underwater areas which Iran claims in the Gulf of Oman.

Abdollah Entezam, chairman of National Iranian Oil Co., said the two new regions will be considered "open" for bidding March 1. As in the case of District 1, Entezam makes no effort at all to define the boundaries which lie out in the Gulf of Oman.

District 3 adjoins the southern limit of the international consortium's concession area at its southeastern extremity, just to the east of the Strait of Hormuz. District 4 extends all the way eastward to the Iranian-Pakistan border. The northern extremity of both new districts is latitude 27° north. The dividing line between the two is longitude 59° 25″ east.

Again Entezam found it necessary to describe an exception. As in District 1, it consists of a tract already granted to SIRIP, the Italian-Iranian company. SIRIP has already been granted a block, about equally divided between land and offshore, in District 3.

Since the two new districts are beyond the consortium area, they include offshore waters right up to the shoreline. In District 1, the open territory begins 3 miles offshore because everything within that 3-mile limit is included in the consortium concession.

Application procedure . . . Companies or individuals interested in applying for this acreage have until March 1 to ask NIOC for a detailed questionnaire. This is designed to establish both the technical and financial qualifications of the applicant.

If an interested party passes these two hurdles, he may then get the specifications and agreement forms for an application from NIOC. This will cost 200,000 rials (about $2,500). Those who qualified after District 1 was opened can skip the questionnaire this time.

No proposals will be accepted after May 1. NIOC will take 2 months to examine the applications and decide on awards. These, Entezam said last week, will be announced "in due course."

Sahara Crude Line

to get under way next year. Entrepose Co. has already begun initial surveys.

ENTREPOSE CO., French pipeline contractor, has announced it will start work next year on the 300-mile, 24-in. crude line from Hassi Messaoud field in the Algerian desert to Bougie on the Mediterranean Coast.

The project will be a joint venture with Ste. Parisienne pour Industrie Electrique (SPIE). Entrepose and SPIE have contracted with two French operators in the field, Cie. Francaise de Petrole (Algerie) and Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal), which will own and operate the line under the name of SOPEG.

J. L. Guyot, general manager of Entrepose, said surveys and engineering studies are under way. Construction is to begin next fall, after the Sahara heat has moderated, with completion during 1959. Pipe will be supplied by Lorraine Escaut, a French steel company with a new plant in Sedan.

Initial capacity, with two pumping stations, will be about 100,000 bbl. per day. Ultimate capacity will be 200,000 to 300,000 bbl. per day, depending on development of the field.

Until the 24-in. line is built, Hassi Messaoud crude will be moved by a 105-mile, 6-in. temporary line to the railhead at Touggourt and then shipped to the coast in tank cars (OGJ, Oct. 28, p. 87).

Indonesia Outlook Glum

. . . as Royal Dutch-Shell affiliate gives up big acreage in Sarawak. Government refusal to grant new concessions causes operations of all but Caltex to dwindle.

SARAWAK OILFIELDS, LTD., will give up most of its acreage in Sarawak, British Borneo, at the end of this year.

The Royal Dutch-Shell company will hold 10,850 sq. miles along the China Sea coast where its dwindling production is located. It will surrender another 36,650 sq. miles of concession area.

The company's 1,270-bbl. daily production comes almost entirely from the 55-year-old Miri field. The field's output has been dropping steadily.

Since World War II ended and the Japanese were forced out of Indonesia, the "big three" operating oil companies — Sarawak Oil Fields, Standard-Vacuum Oil Co., and Caltex—have tried unsuccessfully to persuade the fledgling Indonesian Government to grant new oil concessions.

The Indonesians, beset with their own troublesome political problems, have so far turned a deaf ear to the oil companies. At the same time, the government has been able to count on expanding revenues from oil. This has been true because all three companies operating there have strained to get more and more oil from their existing properties.

All three companies have multimillion dollar spending programs under way in Indonesia to expand the oil properties they already have. They have all hoped that this "dollar confidence" expressed in Indonesia might bring on some new concessions. It hasn't.

Stanvac cuts back . . . Last week, one of the three, Standard-Vacuum, tried another tack. The company announced suddenly that it is suspending all oil exploration in Sumatra. The company laid off 15 Indonesian employes December 1 and said more slicing is in prospect for the Indonesian national staff. Stanvac employs 12,000 Indonesians.

The reason? Stanvac says it has run out of room in which to look for new oil reserves.

Stanvac said it is pulling its exploration experts out of Indonesia and sending them to other spots in the Far East—Pakistan and India—where the land areas under exploration are regarded as major.

Harry A. Gibson, Stanvac's coordinator of exploration and producing, stated the company's position:

"We have looked and looked in our old concession areas, and evaluated our geological and geophysical data, and find these areas are of no further interest."

Gibson pointed out that Stanvac decided 10 years ago that the company's south Sumatra fields would begin to decline and that Stanvac's central Sumatra fields could hold back this downtrend only for a short time. The company asked for additional exploration areas at that time. The Indonesians have failed to grant the applications.

Stanvac produces about 59,000 bbl. daily of Indonesia's 350,000 bbl. daily production. Indonesia's total production today is almost 100,000 bbl. daily higher than a year ago, but Stanvac's production has dropped about 2,000 bbl. daily.

Caltex expanding . . . The increase in over-all production has been contributed almost entirely by Caltex. The Royal Dutch-Shell company operating there has maintained an almost stable output of from 100,000 to 105,000 bbl. daily.

Caltex has furnished the dramatic increases from Minas field in central Sumatra. The company is now developing two more fields in the same general area and building pipeline outlets for both. All three fields are located on old Caltex acreage.

Long Voyage Ends

for Persian Gulf barge. It will drill off Trucial Coast.

THE "Adma Enterprise", the Persian Gulf's first offshore submersible drilling barge, reached home base last week after a 3-month, 6,800-mile ocean voyage.

The barge, designed by DeLong Corp., New York, and built in Germany, was launched in April. It left the Kiel Canal late in August for the long tow to the Persian Gulf (OGJ, Sept. 2, p. 103, and Sept. 30, p. 71).

The barge is due to spud its first well for Abu Dhabi Marine Areas, Ltd., off the Trucial Coast early next month. The company is two-thirds British Petroleum Co., Ltd., and one-third Cie. Francaise des Petroles.

Before the drilling operation actually starts about 20 miles off the Persian Gulf Island of Das, the barge will be fitted out at the island base. Additional sections will be welded to each of the 10-ft. diameter legs to give them a total length of 161 ft. each. The barge's 140-ft. drilling mast will be assembled and towed to location.

Sun Combine Hits

with new 7,080-bbl. well on costly Lake Maracaibo block.

THE THREE-COMPANY group that bid high for Lot 1 in Lake Maracaibo has completed a flush well that would make their costly acreage look good at twice the price.

Venezuelan Sun Oil Co. has completed SVXS-5 with a tested potential of 7,080 bbl. daily of 32°-gravity crude through a ¾-in. choke. The flow came from perforations in a 100-ft. section of Eocene horizon from 9,470 to 9,570 ft.

The hole has approximately 900 ft. of oil-bearing sands. Total depth is 9,693 ft.

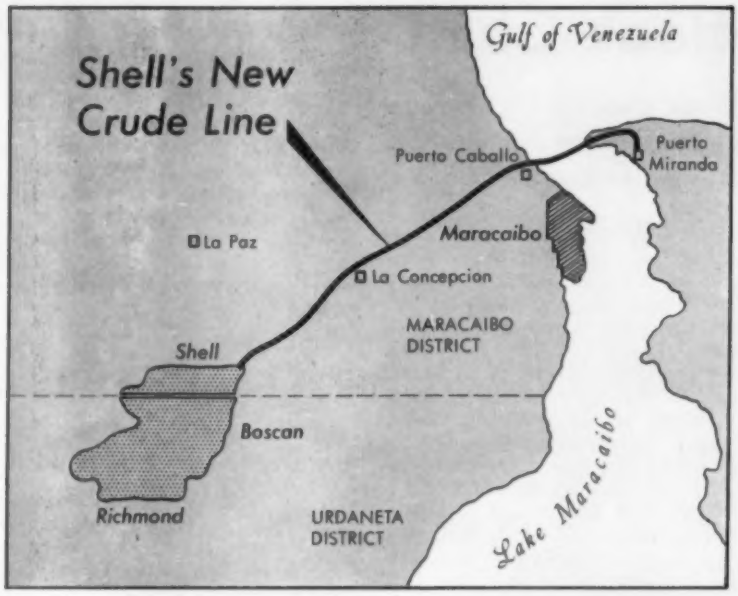
Sun, the operator, and Venezuelan Atlantic Refining Co. each own 45 per cent of the 24,710-acre tract. Their partner is Seaboard Oil Co., with 10 per cent.

The companies paid $733.40 per acre for the concession. But this cost was comparatively low compared with the per-acre cost of most other new lake concessions.

SVSX-5 overshadows Sun's first test on the block. The SVSX-1 has a capacity of a few hundred barrels daily — small by Lake Maracaibo standards.

The new well is in the same class as the best of the Superior Oil Co. discoveries in the national reserve tract bordering Block 1 on the north. Superior's LAMA-5 tested 7,600 bbl. daily from Eocene. LAMA-1 tested 3,300 bbl. daily. The third well, LAMA-7, has found 718 ft. of oil pay (OGJ, Nov. 4, p. 104).

Sun, Atlantic, and Seaboard were the third newcomers to Lake Maracaibo to hit pay dirt. Superior was the first. The Signal-Pure-Hancock, Ohio Standard group came through last month with discovery on Block 4. The 2X Centro tested at the rate of 2,400 bbl. daily of 40°-gravity crude through a 5/8-in. choke (OGJ, Nov. 18, p. 157).



Shell Pushes Boscan Projects

THREE MONTHS ago Cia. Shell de Venezuela revealed its plans for a big $84-million deepwater crude terminal at the neck of Lake Maracaibo..

Almost before the ink was dry on the terminal plans, the company decided to undertake an $8-million project to move more crude to the terminal.

Shell now plans to build a 34-mile, 16-in. pipeline to link the terminal with a field it has just started to develop. The line will move heavy, viscous Boscan crude from the west side of the lake, across the lake neck by an underwater section, and to the new Puerto Miranda terminal.

While the proposed line is under construction, the company will keep two rigs busy drilling more Boscan wells to supply it.

The field . . . Boscan field, about 30 miles southwest of Maracaibo, was discovered in 1946 by Richmond Exploration Co., but there was a hitch. The crude is heavy and viscous with an average gravity of 10°. The Standard of California subsidiary had to promote the markets for the heavy oil before it was economic to produce. Richmond now has 250 wells in its field and it is moving more than 93,000 bbl. daily to its Bajo Grande terminal on the west shore of the lake.

Richmond's field lies in the Urdaneta district of the State of Zulia. Adjoining the Richmond field on the north is Shell's acreage in the Maracaibo district.

Shell drilled its first Boscan well in 1951, but the northern extension of the production hasn't been actively developed until recently. Now Shell has 18 productive wells in its portion of Boscan. The company plans to drill another 17 in the next 6 months. Shell plans to have more than 15,000 bbl. daily moving from Boscan by next April.

The pipeline . . . The proposed Shell line actually is in three sections.

The first will be a 26.5-mile section linking Boscan and Puerto Caballo, northwest of Maracaibo. The second, coated and insulated to prevent a temperature drop in the crude, will be a 4.5-mile underwater link across the narrow neck of the lake from Puerto Caballo to Puerto de Palmas. The third short section will move south from Puerto de Palmas to the site of the new terminal at Puerto Miranda 3.2 miles away.

Because of the viscosity of the crude, two heating stations are planned to make it easier to move. One will be at La Concepcion and the other at Puerto Caballo just before the oil begins to move underwater.

Shell plans a normal capacity of 75,000 bbl. daily for the line. Maximum initial capacity will be 93,000 bbl. daily.

Moving the Boscan crude won't be held up to await completion of the new terminal. Shell will build two 160,000-bbl. storage tanks for the heavy crude right away.

Big Welsh Project

to start soon. BP to build deepwater terminal, crude line at Milford Haven.

BRITISH PETROLEUM CO., Ltd., will start work this month on an $18-million deep-water tanker terminal and a 100,000-bbl. pipeline to link it with the Llandarcy refinery.

The BP project will be the first of several construction jobs that will transform Milford Haven from a little Welsh fishing port to a major crude-oil receiving point for England.

Milford Haven, on the southeast coast of Great Britain, has a deep natural harbor that can accommodate supertankers. BP will begin excavation at Popton Point on the south side of the harbor for bunker fuel and water storage.

Dirt from this project will form the base for a road to Kilpaison Farm on Angle Bay where crude storage tanks will be built. This will be linked with the 70,000-bbl. Llandarcy refinery by the proposed 60-mile crude line.

Plans for making Milford Haven a major oil shipping point for Britain have been in the mill for more than a year (OGJ, Sept. 24, 1956, p. 102).

Milford Docks Co. plans a major construction project for a supertanker terminal and repair center across the bay from the BP terminal site. Esso Petroleum Co., Ltd., owns a site on the north side of the bay which may some day become another deep-water loading terminal.

Delhi Makes Algerian Deal

CANADIAN DELHI OIL, LTD., has signed an agreement with the French Government and a French oil company to secure a concession in Algeria. Clint Murchison, president of Canadian Delhi, announced completion of the deal.

Under terms of the agreement, Canadian Delhi will form a French subsidiary, Franco Delhi, S. A., which will own half of the concession when obtained. The other half will be divided between Ste. de Participations Petrolieres (Petropar), a firm created by the French Government for the venture, and Cie. Franco-Africaine de Recherches Petrolieres (Francarep).

Canadian Delhi expects the concession to be granted within 3 months.

Other American companies bidding for concessions jointly with French interests are Sinclair Oil Co., Newmont Mining Co., Cities Service Co., and Phillips Petroleum Co.

The First HEXANE ISOMERIZATION

In a program to increase octanes of field distillate-derived motor fuels, Atlas Processing Company at Shreveport, Louisiana, has selected HUDSON to construct a normal hexane isomerization unit – the first contracted to be built. Low octane hexane will be fractionated from the total refinery feed stocks, and catalytically converted to high octane fractions to give substantial increase in octanes of finished gasolines.

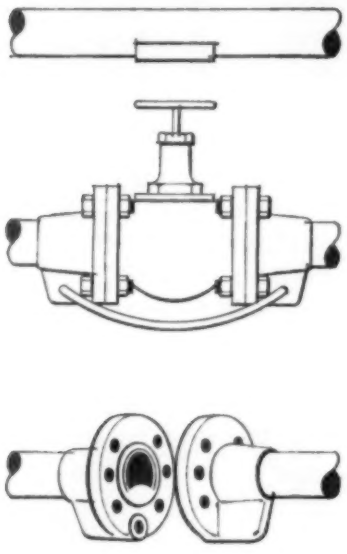
Through 25 years of ever-changing process techniques HUDSON has served the refining and natural gas industries – completing major projects throughout the free world, and building the HUDSON reputation for experience, integrity and ability.

DESIGNERS AND CONSTRUCTORS OF PROCESS PLANTS FOR THE OIL, GAS, CHEMICAL, AND MINING INDUSTRIES

HUDSON
ENGINEERING CORPORATION

FAIRVIEW STATION • HOUSTON, TEXAS

With this new round shape, UNITRACE costs substantially less per foot. And since the steam passage has less outside wall area, external radiation heat loss is reduced. The need for thermal insulation is often eliminated. When insulation is used, it costs less because standard pre-formed pipe covering can be used.
to cut costs,
boost efficiency
of steam traced pipe...
ALCOA UNITRACE has a NEW SHAPE
for lower cost per foot...
easier joining...
less heat loss...better
internal heat transfer



Sections of UNITRACE in the new shape can be easily and quickly joined by the weld and patch method (top). And a brand new UNITRACE flange—with product and steam passages cast as integral parts of the flange—simplifies installation of valves (center) and other flanged connections (bottom).

Want to save money on steam-traced piping? Here's good news for your pocketbook! ALCOA® UNITRACE *has a new cost-cutting shape* . . . a round section matching standard pipe shapes . . . available in 1½", 2", 3" and 4" sizes.

With steam and product passages extruded in a single unit of light, strong, corrosion-resistant Alcoa aluminum alloy 3003-F, UNITRACE completely eliminates the cost of external steam jackets or tracer tubes. And the new UNITRACE shape makes possible these *extra* savings:

Lower cost per foot . . . total volume of metal is less; material costs are lower.

Easier, faster joining . . . new configuration (with exterior grooves for quick steam passage identification) makes mating and joining fast and simple to cut installation costs.

Less external heat loss . . . improved internal heat transfer . . . the new design reduces area for external radiation loss.

The natural corrosion resistance of aluminum makes UNITRACE ideal for handling naval stores, molten sulfur, ammonium nitrate solutions, glacial acetic acid, fatty acids, tar, pitch, wax, urea and similar products which normally require heated transfer lines.

Find out today how *you* can use ALCOA UNITRACE to cut costs and improve efficiency of your heated transfer lines. Call your nearest Alcoa sales office, or write Aluminum Company of America, 904-M Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

NEW!
"ALCOA THEATRE"
Exciting Adventure
ALTERNATE MONDAY EVENINGS

Write for this FREE BOOKLET!
This new, illustrated booklet contains complete engineering, specification and fabrication data on ALCOA UNITRACE in the new shape. It's your guide to low cost heated transfer lines. Write for it today!

Some tips on organization and equipment in

Cooling-Tower Water Treatment

THE ALMOST exclusive use of shell-and-tube equipment in the modern cooling-water system emphasizes the need for clean heat-transfer surfaces.

Keeping transfer surfaces clean results in greater product recovery and increased throughput, the value of which far exceeds the cost for chemicals and equipment used and obtained to achieve this end. Increasingly costly exchange surface also demands that fouling of heat exchangers with scale and corrosion products be kept to a minimum.

Modern chemical treating procedures for prevention of scale, corrosion, slime, and algae, and other associated waterside problems require intelligent supervision for good results. Several treatments have been developed which provide excellent corrosion and scale prevention opportunities at a reasonable cost, provided certain conditions can be met. Water characteristics at this refinery, using Tulsa city water, are quite satisfactory.

Maintaning pH . . . The advantages of low treatment cost and high protection rate against pitting and corrosion, however, cannot be obtained unless certain precautions are taken. These treatments generally function and provide best results in the pH range of 6.0-6.5. The necessity of maintaining pH in this range is not always appreciated. Note that at pH 6.0, the total alkalinity of the circulating water may be in the range of 8-12 p.p.m., expressed as calcium carbonate.

A slight overfeed of acid can easily create free mineral acid conditions in the circulating water with attendant severe corrosion. Also, a low pH control range usually requires a close check on chlorine feed since chlorination will also reduce the pH of the circulating water. The relative difficulty of attaining reasonable control over this function is illustrated by Fig. 1. It can be seen that a slight overfeed or underfeed in the addition of acid is more critical at low pH values.

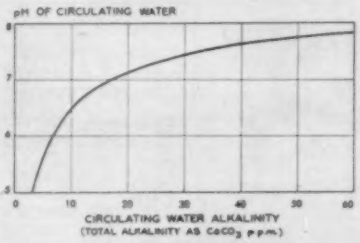
In cooperation with our water-treating consultants, we decided to purchase certain equipment which would provide the desired metering and feeding equipment for handling all aspects of the treating program. We felt that fully automatic pH control wasn't necessary. Results have confirmed this decision.

About the authors

M. J. GOSSOM

J. O. JOHNSON

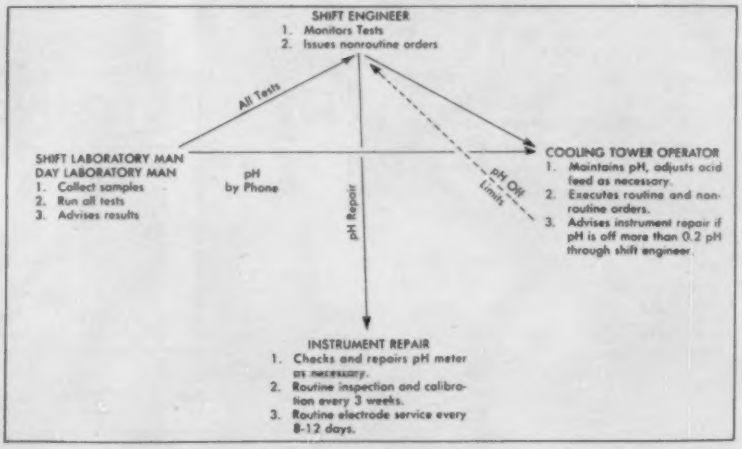
W. J. Gossom, power engineer, and J. O. Johnson, chemical engineer, both with D-X Sunray Oil Co., Tulsa, discuss here some acid and chlorine treating problems associated with a large refinery in which a number of cooling towers are operating. Gossom, who holds a bachelor of science degree in chemical engineering from University of Oklahoma, joined D-X Sunray in 1948, and in 1950 was given responsibility for technical and operational supervision of all plant facilities. Johnson, also a B.S. in Ch.E., from Oklahoma State University, joined his present company in 1954 as Gossom's assistant, following 3 years with Stanolind Oil & Gas (now Pan American Petroleum Corp.) as refinery engineer.



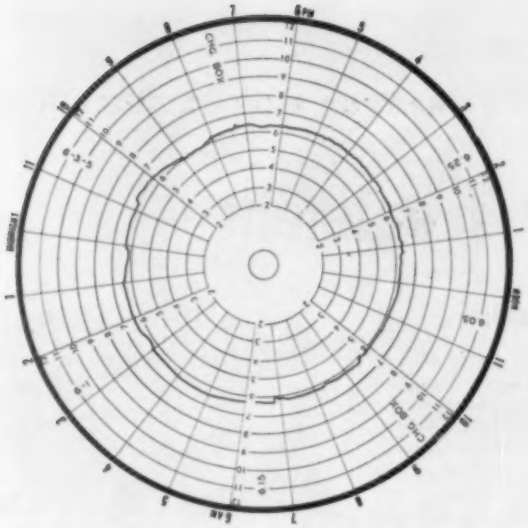
ALKALINITY VS. CONTROL POINT pH —This is for a typical circulating water and shows difficulty of attaining reasonable control over pH. Since chlorination reduces pH, close check on chlorine feed is required. Fig. 1.

Organization

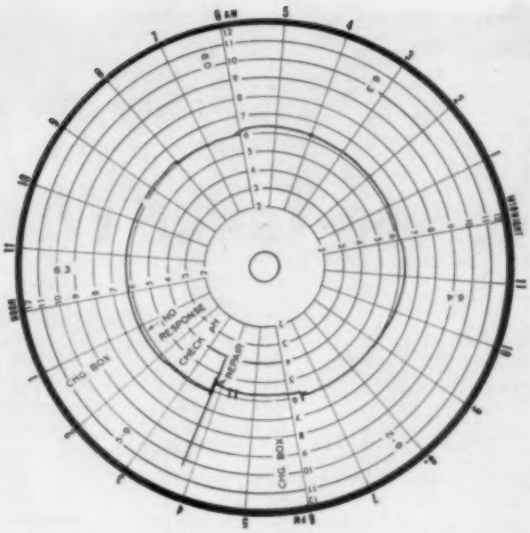
A suitably organized work force was established to carry out the necessary functions incidental to testing of samples and making corresponding changes in the rates of chemical additions. Operating personnel provide for a system of records,


SHIFT ENGINEER
1. Monitors Tests
2. Issues nonroutine orders
All Tests
SHIFT LABORATORY MAN
DAY LABORATORY MAN
1. Collect samples
2. Run all tests
3. Advises results
pH by Phone
pH Repair
pH Off Limits
COOLING TOWER OPERATOR
1. Maintains pH, adjusts acid feed as necessary.
2. Executes routine and nonroutine orders.
3. Advises instrument repair if pH is off more than 0.2 pH through shift engineer.
INSTRUMENT REPAIR
1. Checks and repairs pH meter as necessary.
2. Routine inspection and calibration every 3 weeks.
3. Routine electrode service every 8-12 days.

LABOR AND RESPONSIBILITY—Relationship is shown here between testing lab shift engineer, cooling-tower operators, and instrument-maintenance crews. Fig. 2.



MAINTAINING pH CONTROL—This is typical recorder chart at D-X Sunray's refinery. Control range is 6.0-6.5. Note when acid charge box is refilled there is a characteristic waver in record. Fig. 3.



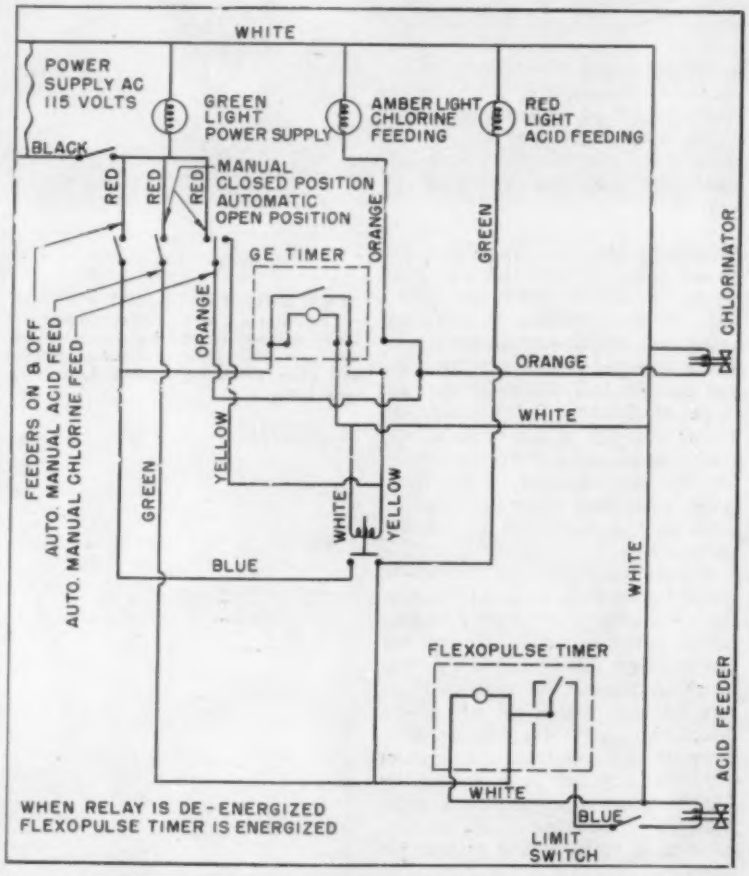
CHECKING pH DISCREPANCY—This is a later chart than that shown in Fig. 3. Operator noticed that when acid charge box was refilled there was no response on chart. Fig. 4.

operating checks and maintenance of essential parts of the equipment.

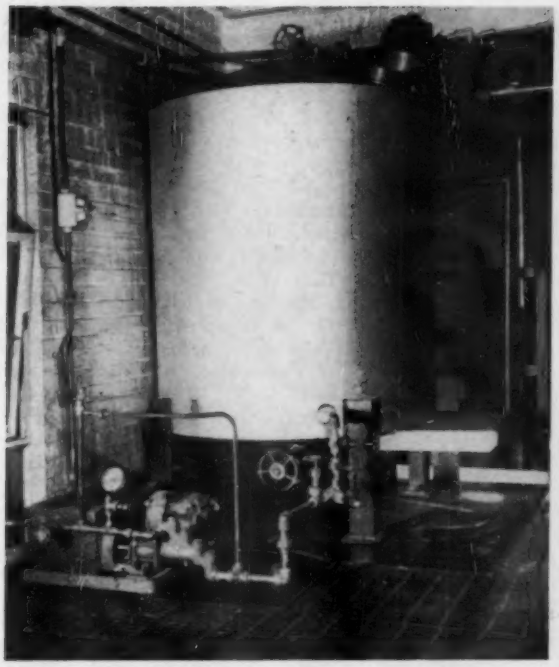
Personnel . . . A water-control laboratory was set up with one man on each of three shifts conducting necessary control tests for both cooling-water and boiler-water control. A second man is used on the day shift only, carrying out additional duties such as laboratory supervision and checking of chlorine residuals in all towers. Chlorine is usually added on the day shift. The day man conducts special tests such as iron, silica, steam conductivity, etc. This day man is also responsible for the addition of any biological or special treatments when such are necessary, including the spraying of special areas of the towers for algae, slime, or fungi control. Additional labor is used as necessary for these special projects.

Water treating teamwork . . . Fig. 2 indicates the relationship of the testing laboratory with respect to the shift engineer, cooling-tower operators, and instrument-maintenance crews.

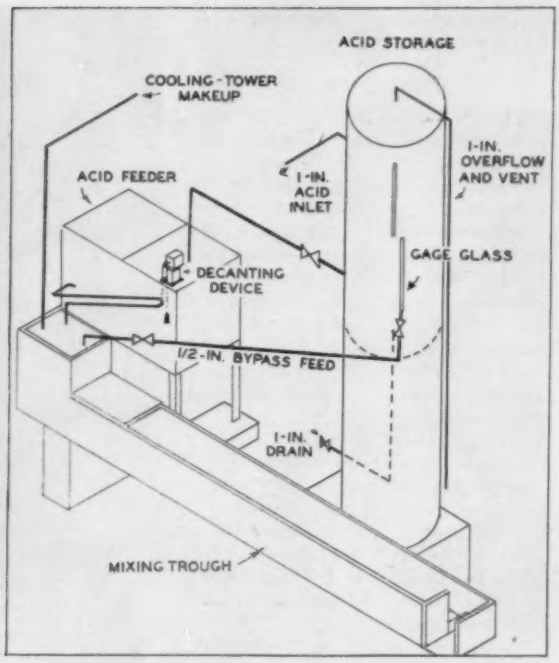
The results of the lab tests are reported to the shift engineer at least once each shift or more often, as necessary. This information and any specific orders are then passed on to the cooling-tower operators who make necessary adjustments in chemical feed. The operators compare and record on the pH recorder chart the periodic pH test reported by the laboratory. If the discrepancy between



INTERLOCK SYSTEM—Electric circuit is shown for interlock between acid and chlorine feed systems. When chlorination finishes, the acid control timer is returned to the circuit permitting resumption of acid feed. Fig. 5.



ADDING CORROSION INHIBITOR—A typical installation in the D-X Sunray West Tulsa refinery water-treating system. Fig. 6.



ACID-FEED SYSTEM—The layout of the acid feed equipment is shown here including the mixing trough. Fig. 8.

meter and laboratory values is more than 0.2 pH, the instrument-maintenance department is notified and the defective unit is quickly repaired and checked out.

Circulating water pH . . . The tower operator uses the recording pH meter very effectively in adjusting the acid-feeding equipment. Ordinarily he tries to maintain a pH of 6.2 in the circulating water. The actual control range is 6.0 6.5. The ability to maintain pH control is illustrated in a typical recorder chart shown in Fig. 3. Fig. 4 also shows a later chart taken from the same instrument. Note that the pH check at 11:30 a.m. indicated perfect agreement between the laboratory and recording instrument. However, the tower operator noticed that when the acid charge box was refilled at 1:15 p.m., no characteristic waver in the recorded line was noticed.

In such cases the laboratory is notified and samples are taken and pH determined. The value in this instance showed a discrepancy greater than 0.2 pH. Instrument maintenance was notified and the equipment was repaired, checked, and returned to service. Usually, this maintenance only involves cleaning of the cell which has become fouled by accumulated sediment and oil. Periodically, additions

POWER CHLORINE ACID
1-POWER SWITCH
2-AUTOMATIC
3-ACID SWITCH-FEEDS ACID WHEN ON IT OPERATES FLEXOPULSE TIMER
4-CHLORINE ON WHEN SWITCH IS ON

PANEL BOARD—This shows power, chlorine and acid lights, timers, and pH indicator-recorder. Fig. 7.

CHLORINATOR—These are used for adding chlorine through suitable solution diffusers located in the cold wells. Fig. 9.

of potassium chloride electrode solution are required.

Equipment

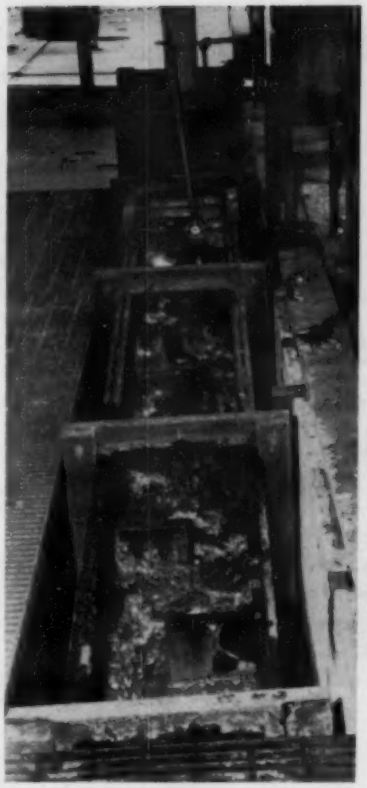
The pH measurement and recording is accomplished with the use of Leeds & Northrup pH recorders capable of measuring and recording pH in the range of 2.0-12.0. Acid feed is accomplished by decanting feeder, the day tank of the feeder being lead lined. The rapidity with which the decanting arm is lowered is controlled by a timer. The amount of 93% sulfuric acid added is directly controlled by the timer setting and is readily adjusted to meet changing conditions.

The corrosion inhibitor is pumped to the tower sump is solution form, using a standard, mechanically adjustable, positive-displacement pump.

Chlorinators are used for adding chlorine through suitable solution diffusers located in the cold wells. Another timer controls a motor actuated shutoff valve on the chlorine line leading into the chlorinator. Chlorination is automatically instituted on a daily basis for most tower systems with the length of time controlled by the timer. Chlorine is obtained in ton cylinders which are handled on a traversing chain fall equipped with a 5000-lb. compound suspension scale (5-lb. graduation beam scale). The cylinder-handling equipment makes operation convenient and safe. Much emphasis has been placed upon safety measures necessary in the handling of chlorine as well as acid. Safety regulations are issued to personnel for the handling of chlorine.

Electric interlock . . . The acid and chlorine feed systems are electrically interlocked in such a manner that acid feed is interrupted while chlorine is being added to a system. At the end of the chlorination period, the acid control timer is returned to the circuit, permitting a resumption in the feed of acid. A manual control is imposed in the automatic circuit to permit chlorination and acid feed to proceed simultaneously, if desired for any reason. Under ordinary circumstances, the addition of chlorine causes the formation of sufficient acid to maintain the pH of the circulating water within the recommended limits. For that reason, it is desirable to discontinue the feed of sulfuric acid during such periods.

The electrical circuit for this interlock system is shown in Fig. 5. Figs. 6 to 10, inclusive, show typical installations of equipment for the addition of corrosion inhibitor, acid feeding and mixing equipment, layout of the acid-feeding equipment, a typical chlorinator, and a typical control panel.



ACID TROUGH—This is acid feed and mixing equipment. D-X Sunray uses acid of 93 per cent strength since this does not require heating coils to prevent freezing. Fig. 10.

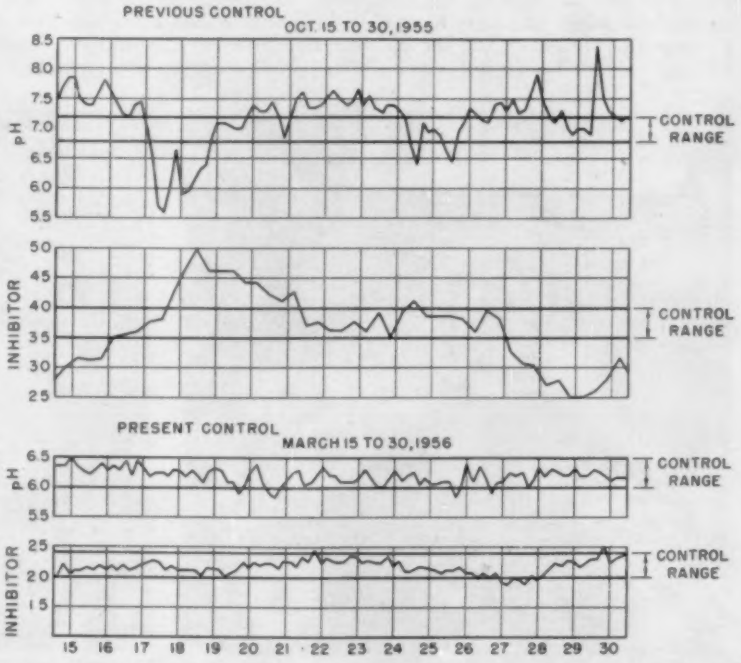
Results Obtained

Before this equipment and plant supervisory organization was installed, application of acid and treatment in general was rather variable and unsatisfactory. Such variations could not be tolerated if the best results were to be obtained with the corrosion inhibitor to be used. Fig. 11 illustrates the contrast in balances before and after the "engineering approach" was applied to the need for better control and maintenance of balances within limits.

This system of control naturally made the corrosion inhibitor more effective. Equipment inspections, as well as a continuous corrosion testing program, have indicated a satisfactory reduction in the average rate of corrosion. Fig. 12 illustrates test specimens showing the degree of attack "before" and "after". In addition to the reduction in corrosion, the algae and slime problem has been brought under control satisfactorily and cheaply.

Equipment Maintenance

It may be thought the pH recording equipment, in particular, requires constant repair in order to keep it in proper condition. Our experiences have shown that the equipment rarely needs more than routine cleaning and additions of potassium chloride



BEFORE AND AFTER CONTROLS—Contrast in balances is shown before and after the "engineering approach" was taken in coordinating water-treating activities. Fig. 11.

electrode solution. With the frequent laboratory checks against the instruments at each tower, there is little difficulty in assuring proper operation of the equipment.

Cell cleaning frequency . . . As the various systems passed through a cleaning up stage, after application of water treatment, the pH cells did require fairly frequent cleaning. With the water-treating problems under control, cells needn't be cleaned so often. Now, with clean water, the cells require some cleaning and adjustment every 10 days, on the average. The cell-cleaning frequency is set up on this basis. We also found that oil contamination did not interfere as badly as might be expected. Oil approaches 25 p.p.m. at various times and in one system oil contamination is present almost constantly to the extent of 20 p.p.m. without causing undue difficulty with the electrodes in this system.

Acid feeder . . . Certain maintenance is required on the acid feeder. The grease fitting on the swing arm should be replaced before the feeder is put in service, using a lubricant suitable for contact with acid. We have used, and like, the standard stick lube for strong acid, replacing the existing grease fitting. The lubricator is given one twist per day to assure proper lubrication of this joint which is contacted by acid. Chassis lube is used on the lowering chain to protect it from corrosion. Once monthly, the old lube is washed off with kerosine and a new coating of chassis lube is applied.

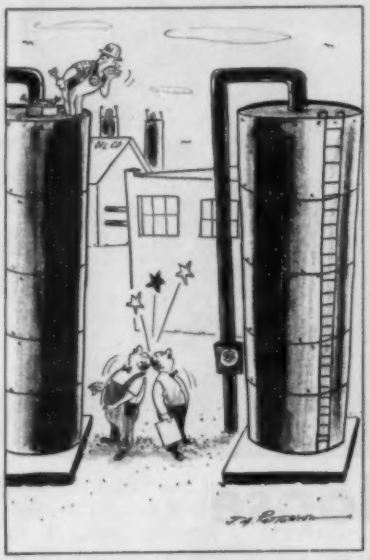
Acid strength . . . We use 93 per cent acid in preference to 98 per cent since the 93 per cent acid freezes at —29° F. and does not require heating coils in order to prevent freezing. Proper installation of the acid storage tanks in very important in order to prevent the accumulation of sludge in distribution lines and feeding equipment and to permit proper drainage of a tank if it should become necessary at any time. A small bypass line has been installed to act as an emergency gravity feed line from the tank in order to provide repair time for the acid feeder itself, if such should become necessary from time to time.

Acid mixing . . . Normally, the acid is discharged into a portion of the makeup stream which enters the head box of a specially designed mixing trough. Photograph (Fig. 10) illustrates typical placement of equipment with the acid-treated stream discharging from the mixing trough into the cold well or cold water flume from the tower. The mixing troughs were constructed of redwood and coated with tar before being placed in service. They assure adequate mixing of acid and water, preventing stratification of the acid which would result in severe damage to concrete basin walls. In general, we have followed the rule that all makeup is passed through the mixing trough when the total makeup is less than 500 g.p.m. If the total makeup actually exceeds this figure, then the excess portion is added direct to the tower sump.

TEST SPECIMENS—Corrosion test data for the "before" and "after" periods is given as follows:

CORROSION TEST DATA

	Specimen number	Days exposed	Mg. loss	Avg. corr. rate, m.p.y.
Previous control	M-188	32	459	13.6
	M-192	32	241	7.1
Present control	AC-606	28	13	0.4
	AC-613	119	28	0.2



"Hey, you! !"

Methods and Equipment Used

Dianodic (Betz Laboratories, Inc.) system of water treating.

Leeds & Northrup pH recorder.

Acid feed: American Water Softener Co. decanting feeders.

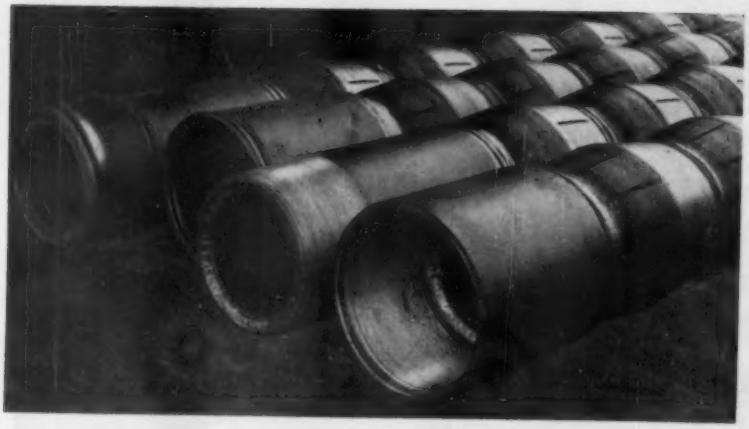
Decanting arm: Controlled by Flexopulse timer (Eagle Signal Corp.).

Chlorinators: Wallace & Tiernan.

A Type 27 General Electric timer controls shutoff valve on line leading into chlorinator.

Chlorine is handled with Code 280 Fairbanks-Morse 5,000-lb. compound suspension scale.

On acid-feeder swing arm, Merco-Nordstrom standard stick lube is used, replacing existing grease fitting.



New double-wall liner

combats collapse

. . . and aids in sand control

By D. H. Stormont
District Editor

A NEW TYPE of double-wall liner, designed to provide maximum resistance to collapse, may prove a valuable aid in wells where sand control is a problem.

Its design also makes for less perforation plugging, both during the time the liner is being run and after it is installed. With more perforations open, sand cutting is minimized because of the lower oil flow.

But if perforations are cut out, or should nonuniform loading result from sand sloughing or formation movement, the convex shape of the forgings used as the outer wall will provide a much higher resistance to collapse than that of conventional pipe.

First of the new-type liner was run in West Cat Canyon wells, near Santa Maria, Calif. During the first 6 months one liner was installed, oil output was higher and sand production lower than before a conventional liner collapsed—as is discussed later on.

Why liners fail . . . Liners can fail or collapse for a number of reasons, most common of which are:

1. Sand particles enlarging the perforations to such an extent its collapse strength is lost.
2. Nonuniform loading, as a result of earth movement or from sand sloughing, may bend the pipe and destroy its resistance to collapse.
3. High hydrostatic pressures may cause failure of pipe which is slightly ovalized, dented, or otherwise deformed.

Insofar as perforation cutting is concerned, the cause frequently can be traced to many holes becoming plugged while the pipe was being run. Tests have shown that plugging can occur even while the liner is being lowered inside casing.

Failure to reopen all the perforations by cleaning results in increased flow rates through those remaining open. The high flow rates increase the sand-carrying power of the oil, particularly where the crude is low gravity. Over-all result will be localized sand cutting to such an extent that collapse occurs.

Nonuniform loading is believed to account for much of the pipe collapse in California fields. Earth movement in the Wilmington field and in other faulted, loosely consolidated pools causes a number of wells to be redrilled or repaired each year. In deeper zones of Ventura field, mechanical deformation can be quite severe.

There liner failures are believed to be due either to plastic flow of siltstone and shale, or from cavities and protrusions created by sandstone spalling and sloughing into the well bore.

Design of new pipe . . . The new-type liner, labeled Fether pipe by its developer, Fether Manufacturing Co., was designed to assist in sand control and to give added protection against collapse.

The double-wall effect is achieved by placing 8-in. convex-shaped perforated sections over an inner wall of standard slotted liner. The forged shapes are electrically welded to the pipe and to the adjacent sections.

This results, in effect, in a series of triangles with the inner pipe forming the third leg. Thus collapse resistance is provided vertically as well as around the pipe. A dent in the pipe does not break down its collapse resistance as is the case with conventional pipe. It has been estimated that the liner's collapse strength is almost twice that of unperforated pipe of the same gross weight; that under nonuniform loading conditions it is 5 to 15 times stronger than conventional perforated liners.

In liners run to date, 5½-in. o.d., J-55 pipe formed the inner wall. The outer wall, also of J-55, has a maximum o.d. of 7⅜ in. Wall thickness of the 8-in. long convex forgings increases as their diameter decreases so that a total wall thickness of about ¾ in. is provided at the smaller diameter. Weight of the liner is 41 lb. per foot.

. . . Perforations used in the inner pipe are 2-in., 200-mesh slots spaced 36 per foot. The outer perforations are 180-mesh, spaced 18 per foot and radially in line with those in one row of the inner pipe.

Perforations are provided in only the top portion of each convex section. In this position they are not as apt to be plugged when the liner is run, and are more easily cleaned after it is in place. This feature, plus use of large-size perforations, makes for maximum oil production. Because all perforations are functioning and the oil flowing at lower velocities, sand abrasion on the walls of the slots is reduced.

. . . Special tool joints are used on the 40-ft. lengths of Fether pipe in order to provide uniform strength in the coupling areas. Pins are 6⅝-in. o.d. and 5-in. i.d., or they have a wall thickness of 13/16-in. The boxes have an o.d. of 7⅜ in. Conventional 8-round, long threads are used.

How first string performed . . . First string of Fether pipe was run in a redrilled well of Douglas Oil Co. in West Cat Canyon field. Liner in the original hole collapsed in the latter part of 1956.

Prior to failure the sand cut had run as high as 80 per cent. An average sand cut of about 35 per cent was produced through the 60-mesh perforations. To keep it on production it was necessary to pull the well almost monthly. In one case a new pump had to be replaced less than 24 hours after it was run.

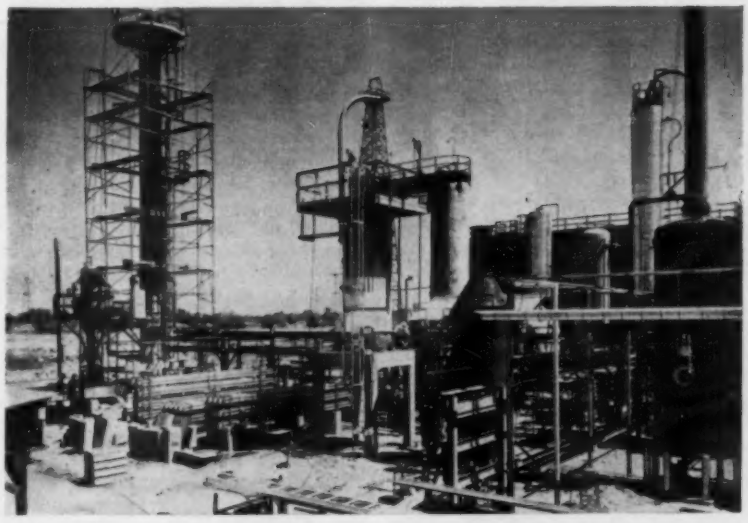
The well was redrilled in March 1957. The new hole, which was bottomed only a short distance from the original, was cased with 8⅝-in. pipe to the top of the sand at approximately 3,500 ft. About 300 ft. of new-type liner was run to the 3,800-ft. total depth. Although outer diameter of the liner was 7⅜ in., it was run in the 7⅞-in. hole without difficulty. Light crude oil was used in drilling the oil zone, and the hole was pressure-washed with light oil after liner was run.

Five months after the well had been recompleted it was still producing about 50 bbl. of 10°-gravity oil daily. Tubing was set high, at a depth of about 1,500 ft., to aid in sand control. The sand cut averaged only about 1 per cent during this period.

The sand produced was of the "flour" type, and remained in suspension. That none had accumulated in the bottom of the hole was shown by the fact tubing could be lowered to the redrilled total depth.

Only production lost was due to mud surges plugging the casing above the liner. In redrilling the hole, trouble was had in maintaining mud circulation at one interval. On two occasions backflow of this mud (and 20 per cent sand) formed plugs at the top of the liner, where velocity was reduced upon the fluid leaving the liner. The plugs, 30 to 40 ft. long, were readily removed.

Based on the liner's apparent ability to cope with the sanding problem, Douglas may drill a number of wells in the low-gravity field. In September it was observing the performance of a new 3,792-ft. well in which the new-type liner was run from the 3,517-ft. casing point to total depth. With tubing hung about 2,300 ft. off bottom, the well produced as much as 200 bbl. of 11°-gravity crude daily. It likewise was producing only a small amount of fine sand.



New Unifiner for Mohawk

THIS NEW 925-bbl. per stream day Unifining unit of Mohawk Petroleum Co. is now processing thermally cracked naphtha derived from California crude. The unit went on stream recently at the company's Bakersfield, Calif., refinery. The unit was erected by Procon, Inc., and was designed and licensed by Universal Oil Products Co.

New 350-mile pipeline is protected by polyethylene tape with outer wrap of asbestos felt,

Three kinds of pipe protection are

. . . in line with policy of testing materials

By Paul Reed
Pipeline Editor

AN INTERESTING and significant comparison of established and new pipe-protection materials can be found on Natural Gas Pipeline Co. of America's major 1957 construction project. Coal tar, asphalt, and plastic tape are being applied on different sections.

This undertaking starts with a large gathering system and then proceeds along a 350-mile main line from Bridgeport, Tex., across southern Oklahoma and terminates at Fritch, Tex. Furthermore, there is also an application of a fourth material—a cold-applied plastic paint, initially used on this project for certain special purposes.

Other significant features of the project are measures for soil-erosion control and the design of overhead stream crossings.

The project is a strategic move on the chessboard of gas pipelining. For it is designed to transmit gas from the growing Bridgeport producing area, within 45 miles of Fort Worth, via a route through active southern Oklahoma fields to Natural's big Fritch station in the Panhandle. This has been operating as the initial compressor station for 26 years on the company's main line to Chicago.

Material for this article was procured on a trip to construction work on this project when the author visited the spreads at the gathering system and at sections in Schedules 1, 2, and 4.

What is the meaning of Natural's use of three different materials for the main pipe-protection program? While the company has not announced its purpose, it appears to be in line with its characteristic policy of testing materials and methods of merit which may contribute to economical long-range pipelining.

This policy reflects current pipeline trends toward more extensive evaluation of new techniques so as to compare them with practices of long-established worth.

Coating and Taping Program

The current pipe-protection program for the Bridgeport-Fritch project is carried out as follows:

1. The criterion of pipe-protection value for Natural has been and continues to be the coal-tar coating which has been the mainstay of the company's long-range program. This is applied on approximately 16 per cent of the project under construction.

2. Recently the economies of asphalt have led to larger use of this type of coating. Two years ago, Natural Gas Storage Co. of Illinois, an affiliate of Natural, satisfactorily used asphalt on a 30-mile, 36-in. line near Herscher, Ill. Now on this current project, Natural is coating approximately 65 per cent of all the pipe with asphalt.

3. Because of the economies of application and the promising possibilities of adhesive polyethylene plastic tape, 16 per cent of the project is protected with tape coating which entered long-distance big-inch pipelining little over a year ago.

Application Methods and Materials

These three types of pipe-protection materials are applied in three different ways:

1. Mill coating with asphalt of pipe of 4 to 16-in. diameter at plant while the pipe is in transit to the gathering system;

2. Field coating and wrapping of coal tar and asphalt by traveling machines on 20 and 26-in. pipe;

3. Field wrapping of plastic tape on 20-in. by traveling machine on 20-in. pipe.

Details of the pipe protection schedule are shown on the opposite page.

The costs of materials for the three main types of pipe protection on the project are indicated by the following comparison:

ESTIMATED COSTS OF ALL PROTECTION MATERIALS (INCLUDING WRAPPINGS) APPLIED ON 26-IN. PIPE

Type of material—	Cost per mile
Asphalt	$1,200
Coal tar	1,700
Plastic tape	3,300

coal-tar enamel with glass-mat wrap, and asphalt coating with kraft-paper wrap. Thus . . .

being applied on NGP's major project

and methods of merit which may contribute to economical pipelining

Details of Pipe-Protection Schedule

Schedule, location, and contractor—	Miles	Pipe diameters (in.)	Pipe protection, application methods, and materials
Gathering system in Bridgeport area	12	20	1. 20-in. pipe field coated.
Fulton-Brodie, Inc. (contractor)	140	4-6-10-12-16	2. 4 to 16-in. mill coated. Coating includes asphalt primer and asphalt enamel, glass mat and kraft paper.
Schedule 1— Bridgeport, Tex., to Healdton, Okla. Eastern Pipeline (contractors)	80	20	Field wrapping with plastic tape without primer and 8-lb. pipeline felt.
Red River crossing, Montague County, Texas. R. H. Fulton & Co. (contractor)		20	Field applied coal-tar primer and coating, glass mat, 8-lb. pipeline felt and rock shield.
Schedule 2— Healdton to Mountain View, Okla. H. B. Zachry Co. (contractor)	87	26	Field applied asphalt primer and coating, glass mat and kraft paper.
Schedule 3— Mountain View, Okla., to Wheeler, Tex. River Construction Corp. (contractor)	86	26	Field applied asphalt primer and coating, glass mat and kraft paper.
Schedule 4— Wheeler to Fritch, Tex. River Construction Corp. (contractor)	87	26	Field applied coal-tar primer and coating and glass mat.

Cost of asphalt application materials is 64 per cent of that for coal tar. Costs of application of asphalt and coal tar are similar.

Application Costs

But cost of application of plastic-tape materials is about 55 per cent of that for coal-tar and asphalt materials. Consequently plastic tape becomes competitive as a result of reductions in contractors' prices which reflect the lower cost of applying plastic tape.

Early in the project, it was found necessary to have all asphalt-coated pipe wrapped with kraft paper to hold the coating to the pipe and prevent sagging in warm weather. Therefore both mill-coated and field-coated pipe is wrapped with kraft paper. But kraft paper is not needed for the coal-tar coating applied on the project.

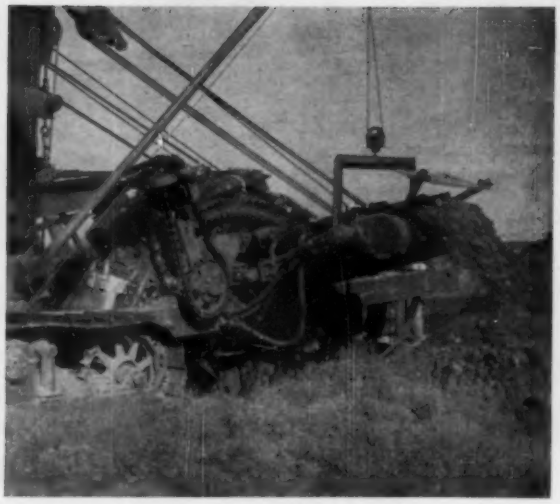
Both coal-tar and asphalt coatings are wrapped with glass mat which is imbedded as near the center of the hot coating as practicable.

The fourth material referred to is a cold plastic paint applied at approaches to overhead stream crossings, at some valves, and at some short places on the pipe.

Protection in Rock

For the main line as a whole 10 per cent of the ditching is in rock. In Texas south of the Red River and in Oklahoma, the rock is mostly tight sandstone. Some limestone was en-

HOT PASS being run in the pipe gang on 20-in. pipe in Bridgeport area.



LARGE DITCHING MACHINE digging trench for 26-in. pipe near Rush Springs, Okla.

countered in the Schedule 1 section contracted by Eastern. In the Panhandle section contracted by River, the rock is caliche.

Of the total rock traversed, Schedule 1 has 40 per cent; Schedule 2, 40 per cent; and Schedules 3 and 4, 20 per cent.

Padding machines were used experimentally on some rocky sections at times in Schedules 1 and 2 sections. These sifted and conveyed dirt from the backfill or spoil bank to protect the pipe. Rock shield and dirt padding were used in Schedule 2. Schedule 3 has little rock. In a 5-mile stretch through caliche in Schedule 4, rock shield is used but no dirt padding.

The company specifies where rock shield is to be used. The procedure followed is to have the lowering-in inspector set stakes along the ditch to show where rock shield is to be used. This is done in advance of coating-and-wrapping operations.

Erosion Control Dams

Erosion mitigation—as part of the initial construction program—is being undertaken by Natural for the first time. On previous projects, the building of dams to stop threatening land erosion had been the responsibility of the maintenance organization after the line had been in operation.

For the gathering system in the Bridgeport area, 13 large erosion dams have been built. These dams are all located down the slope from the pipeline. The purpose of such a dam is to check the extension of a deep unstable gully which otherwise would cut its way uphill to undermine the pipeline.

The company has learned from past experience with other projects that such undermining by gullies can be expensive. Now the policy is to prevent any gully from working upstream within 200 ft. of the pipeline.

South of the Red River, some gullies near the line are 25 to 60 ft. wide and 40 ft. deep.

Erosion control is accomplished by building a dam just above the upper end of the gully. Drainage from a dammed area is provided by a "drop inlet" consisting of an L-shaped tube of 18 to 30-in. diameter. This extends from behind the dame to a point downstream below the dam. There is no intention that erosion dams should provide stock ponds.

Overhead Spans

"Self-supporting" stream - crossing spans recently designed by Natural are distinctive features of the project. There are 13 of them—9 for the main line and 4 for the gathering lines, all in the Bridgeport area. The shortest is 110 ft. and the longest is 200 ft. in length. They are designed with cables and truss bracing so as to hold the pipe in compression rather than in tension at the crossing. These spans have the advantages of economical construction and assurance of continuous service during flood periods.

Welding

For welding, the pipe specifications call for joint design with the 37½° bevel for most of the pipe. A small percentage of the pipe has been delivered with 30° bevels. The 30°-bevel pipe includes 12 miles of 20-in. laid by Fulton-Brodie, Inc., contractor at the gathering system, and some of the 20-in. pipe supplied to Schedule 1, contracted by Eastern Pipe Line Contractors.

The welding procedure followed by hot-pass welders on the gathering-system spread was modified by the company so as to be a two-stage operation. Where two hot-pass welders are working, one of them makes a fairly quick pass for stress relieving in which less metal is deposited than in the second pass. The other hot-pass welder follows to clean out the slag and fill up "wagon tracks," "undercuts," "windows," etc.

At the other sections covered by Schedules 1 to 4, the hot-pass welders work in the usual way where each welder completes the entire functions of hot-pass welding in a single stage operation.

In the hot pass altogether only about 1/32 in. and not more than ☆ in. of metal is deposited.

To provide for contraction of the pipe, the lowering-in operations are planned so that there are at least three places per mile, on an average, where there are open-end sections before final cutting and fitting and tie-in welding.

In the preparation of this article the author was assisted by Robert G. Strong, director of engineering division; David C. Palm, general superintendent of pipelines; H. E. Boomer, field superintendent; H. L. Wright, J. L. Rhoads, G. E. Wagner and G. W. Conely, chief inspectors of the project, of Natural Gas Pipeline Co. of America.

Construction features are dealt with in more details in later discussion of the details of the different sections of the project. **End.**

1 CATALYST EROSION IN CAT CRACKERS

case histories of its control

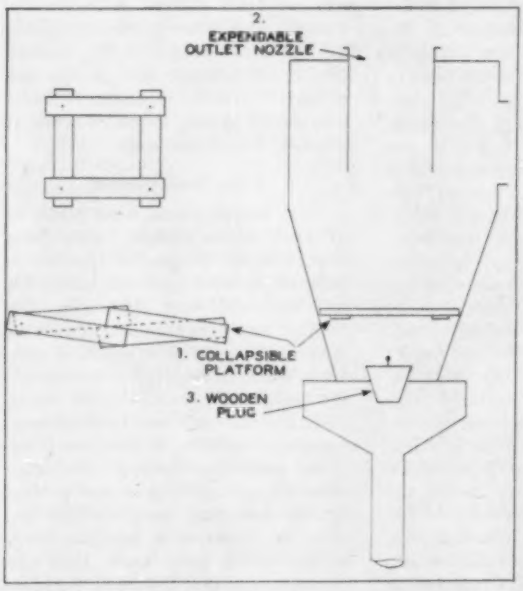
One of the most serious maintenance problems in fluid catalytic cracking units is erosion of the catalyst-carrying system. Larry Resen, the Journal's Gulf Coast processing editor, decided to see what the refiners in his area were doing about it. He found that many of the problems are being solved, and he's put together a series of case histories, showing problems and solutions. Other installments will follow at regular intervals.

Problem: Lining cyclone surfaces

Solution: Use expendable pipes; erect scaffolding

PHYSICAL DIMENSIONS of cyclones serve to hamper the installation of castable linings. This problem is severely aggravated when the smaller-sized cyclones are used. Catalyst velocity is highest as it enters the cyclone and passes along the outer sweep. In the larger-sized cyclones, it's possible to gunite a portion of this entrance, and hand trowel for some distance inwards. In the smaller equipment, however, it's difficult to get a proper job done. This is quite significant in these areas. Not enough lining means it will wear away sooner and bare metal will be attacked. If too thick a lining is installed, the already narrow opening will be made smaller, and a venturi effect set up which will increase velocities and hence increase erosive rates.

One way of getting around this is to equip the cyclones with expendable outlet pipes (Fig. 1). These can be rolled from 3/8 or ½-in. plates and welded in place at the top of each cyclone. This thickness of metal will usually last just about one run. At turnaround, the welds are cut and the pipe removed and discarded. The large opening existing makes it possible to get into the cyclone and do a proper lining job. A new expendable outlet pipe is then welded into position and the cyclone is ready for another run.



SIMPLE CHANGES aid in cyclone lining maintenance. Fig. 1.

Maintenance hints . . . A common problem with cyclones is the difficulty in working within the equipment itself. The sloping sides make it troublesome for a man to retain his footing and also to establish scaffolding. A simple solution to this can be found with the use of four equal lengths of wood. These should be placed in the shape of a square with each of the ends protruding a few inches beyond the body of the square (Fig. 1). They should be nailed together with one nail at each corner. The sides of the square can then be brought together as with a set of parellel rulers to make a long slender object. This makes it possible to pass it through narrow openings into the body of the cyclone. Inside it can be opened back into the shape of a square and placed in a horizontal position, wedged against the sloping walls of the cyclone. This will provide a firm base upon which a man can work or scaffolding may be erected. It can be easily removed, when the work has been completed. The lengths of wood will naturally be determined by the size of the individual cyclones.

Removal of old linings and clearing of obstructions from dip legs can be expedited by a few simple techniques. Prior to working within a cyclone, a tapered wooden plug should be used to seal off the outlet at the bottom of the cyclone. This will prevent particles removed during maintenance work, as well as small tools, from falling down to lodge in a dip leg. Foreign material will accumulate within the bottom of the cyclone and can be removed before putting the unit back into service. The wooden plug should be equipped with a hook eye to facilitate its remvoal once the job is completed.

A tube knocker, like those used in cleaning furnace tubes, is suggested for cleaning out dip legs. Even with the precautions noted, foreign material can lodge within a dip leg during a run. If not removed, it can result in severe erosion within the immediate area, or else cause the dip leg to fill completely with catalyst, backing up into the cyclone and rendering it inoperative.

In early work a weight on a string was dropped through each dip leg, but frequently the weight was not sufficient to dislodge all of the obstructions. Tubing run through the dip leg would often bypass the obstruction. The air-turbine tube knocker, meanwhile, will insure that the dip legs are perfectly clean before start of a run.

EROSION CONTROL IN CAT CRACKERS

Problem: Lining surfaces in catalyst service

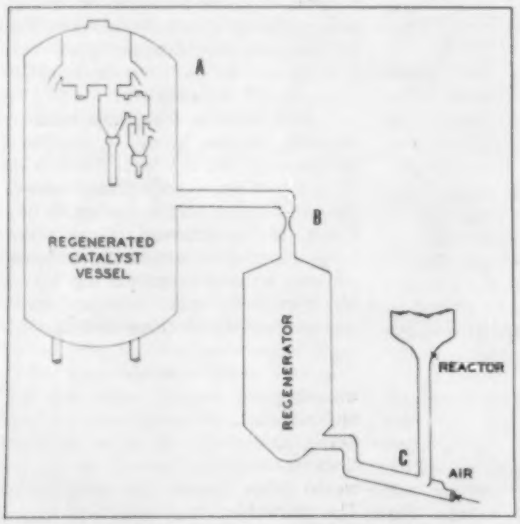
Solution: Use insulating castable topped with wear castable; cure carefully

CATALYST EROSION is highly influenced by the velocity and density of catalyst and the turbulence existing within the catalyst system. When velocity is high, the erosion rate will invariably be high in the same vicinity. High density and high velocity combined result in the most highly accelerated erosion. Where there is venturi action due to a restriction in flow lines, (Fig. 1B) or a high velocity and/or turbulence exists as in the vicinity of the spent catalyst standpipe and carrier air line (Fig. 1C) and in the inlets to the cyclones (Fig. 1A), catalyst erosion is found to be quite severe. In most carrier lines, erosion takes place at a more modest rate, and in the large vessels, catalyst erosion is not especially severe.

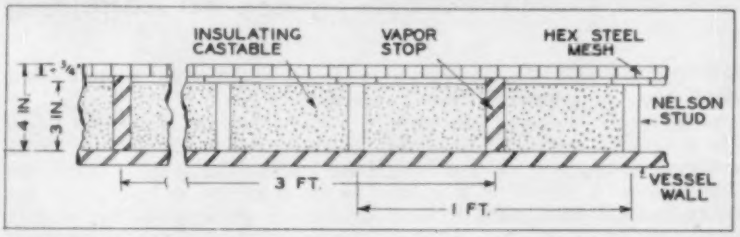
In all of these areas, however, it has been necessary to install linings to protect the metal line, vessel, or fitting which would otherwise directly be exposed to catalyst flow and erosion. One suggested lining is the use of an insulating-type castable material applied directly to the metal. This is topped with a wear-castable material, reinforced with hex steel mesh. The insulating castable consists of a mixture of vermiculite and Lumnite cement with a density of 50-60 lb. per cu. ft.

The wear castable is a ground-fired aggregate mixed with the same Lumnite cement binder and having a density of about 130 lb. per cu. ft. A "super" wear castable, consisting of fused alumina, silicon carbide, or chrome ores, instead of the fired aggregate, is an alternative for use in the areas noted above where erosion rates are especially excessive.

Most of these mixes are relatively new and no extensive experience has been recorded as yet. They are especially resistant to wear, but have the drawback of being quite expensive. Some also need special binders. This latter provision can result in complicated curing procedures. Some binders may also not be practical to use with pneumatic spray guns.



HIGH EROSION RATES occur at these points in the catalyst system. Fig. 1.



TYPICAL CASTABLE LINING calls for Nelson studs on 12-in. centers, with insulating castable gunite-sprayed on to a thickness of 3 in. Fig. 2.

Application . . . The suggested method to follow in applying the lining is to first install Nelson studs on 12-in. centers (Fig. 2). These studs, which are electronically welded to the interior surface being lined, should be then hammer-tested to make sure a firm weld has been made. Poor welds should be rectified by normal welding methods. The insulting castable is then gunite-sprayed to a thickness of 3 in. which is even with the shoulder of the studs. The stud head is then attached, and the hex steel-mesh screen welded to the stud heads. The trend now is to use 12 Cr hex steel rather than carbon steel. This is to offset a corrosion problem in the reactor and oxidation of the steel mesh in the regenerator.

The wear castable is next sprayed onto the hex steel, filling the voids in the steel as well as the void below the hex steel screen. The stud heads have a thickness of ¼ in., and hence a free space existed between the insulating castable and the hex steel. The wear castable is able to intrude into this space and bind directly to the insulating castable, providing a more effective liner. Excess castable is removed to provide a smooth interior surface to avoid rough spots and spalling.

Vapor stops . . . One preliminary step is made prior to applying any castable at all. This is the installation of vapor stops. These consist simply of a band of metal running around the internal circumference of the vessel. Generally, they are installed every 3 ft., although the interval may be larger in some instances. Their purpose is to prevent a break in the lining from progressing the entire length of the interior surface. If a break does occur, and catalyst erosion proceeds, it is stopped or greatly hindered when it reaches the vapor stop.

Two Modifications

Two modifications were made as a result of experience with these vapor stops. Originally, the ⅛-in. steel strips were tack welded to the interior surface. However, this proved impractical, since once erosion reaches the skin, it could continue beneath the vapor stop on into the adjoining section of lining. Hence, these are now welded continuously to the internal surfaces.

In early installations, the stops were terminated below the surface of the insulating castable. This was done to avoid heat conduction directly to the outer shell. However, it was found that failure of the stops to extend any higher resulted in a

"porpoising" effect. Erosion would cut into the lining, come up to a stop, and work up over the stop into the next section of lining.

New vapor stops were installed equal in length to the Nelson studs. These back up against the hex steel mesh and have given satisfactory service. Heat conduction has not been a problem since such a small surface is exposed.

Curing . . . Probably the most important phase of the lining application procedure is its curing. Experience has shown that a properly cured lining will greatly outperform one which is rapidly put into service following application. Wet curing is recommended for the common lining now being used. It's quite important to keep these linings completely moistened for a 24-hour period before drying. This point should be strongly emphasized.

Following this, the lining should be air-dried for another 24 hours. Heating of the lining can begin by starting up the air blowers. The heat of compression will provide a 200°-250° F. temperature, which should be held for about 6 hours. An auxiliary burner can next be used for increasing the temperature. This should be increased at the rate of 75° per hour until the 600° F. mark is reached.

Water Completely Expelled

This temperature should be held for about 9 hours. During this time, temperature through the lining will increase gradually and on a gradient so that the boiling point of water is reached at the vessel's shell. In this manner, water will be completely expelled from the entire lining. The temperature should then be increased again at the rate of 75° per hour until operating temperature of the unit is reached.

The time element required in this curing period is quite significant during a limited turnaround schedule. Hence, it is suggested that as many startup procedures as possible be keyed in with the curing period to avoid excessive down time. Thus, while the air blowers are operating in the 200° F. range, pressure tests can be made on the unit. Catalyst, meanwhile, may be loaded into the unit during the time the temperature is held at the 600° F. mark. Similar tie-ins of startup procedures with curing time may be made at the discretion of the unit operator.

Problem: High wear and minimum wear areas
Solution: Special additives, modifications, and an intermediate-type lining

EXPERIENCE has shown that catalyst erosion is directly related both to the density of the catalyst and its velocity. Thus a dense catalyst stream moving at 2-3 ft. per second will have little erosive action, while if the rate is above 6 ft. per second, rapid deterioration occurs. Velocities above 125 ft. per second will cause excessive wear under dilute phase conditions.

Generally speaking, when velocity hits the 75 ft. per second mark it's time to think of ways to combat the higher rates. In another case, reference was made to the "super" wear castables. These include additives which increase the effective erosion resistance of the final coating. These additives include fused alumina, silicon carbide, or chrome ores.

It is quite important in selecting these to pick a mixture which is compatible with the primary coating used generally throughout the unit. Thus, it's impractical to develop a dry-curing castable when it will be adjacent to a wet-curing lining. Likewise, a "super" wear mixture will lose its appeal if it cannot be gunite-sprayed onto the vessel or lines being coated.

Slight modifications can make a big difference in high-wear areas. The angle of impingement of the catalyst makes a big difference in the erosion rate. For instance, catalyst striking a plate at a 90° angle will have practically no erosive action. However, this catalyst hitting at a smaller angle tends to scour the surface, thereby resulting in a high erosion rate.

Cutting down on catalyst velocities can also be helpful. In one unit a venturi section is used between the regenerator and regenerated catalyst vessel. Pressure drop across this venturi is used in measuring the catalyst-circulation rate. Unfortunately, the very action of the venturi contributes to a high velocity which is accompanied by severe erosion. A decision has been made to eliminate the venturi and use the pressure drop across the entire transfer line between the two vessels in calculating catalyst-circulation rate.

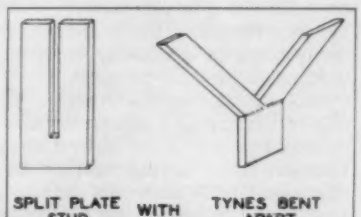
One-shot lining . . . The usual lining, with its insulating castable base, topped by a reinforced wear castable provides protection in most catalyst services. There are substantial areas where this type of lining provides a high degree of overprotection. This is the case in the large vessels where space velocities of 2-3 ft. per second exist, and erosion is relatively mild.

A much cheaper, "one-shot" lining can be used in these services which will perform quite well under the milder erosive conditions. The lining does not require hex steel-mesh reinforcing strips, nor does it consist of two separate liners, the insulating castable plus the wear castable. The one-shot lining material is made by blending aggregate vermiculite and binder to a density midway between the insulating castable and the wear castable. This in-between density of about 90 lb. per cu. ft. compares to a density of 50-60 lb. per cu. ft. for the wear castable. There is sufficient insulating property in the 4-in.-thick liner to contain the heat and enough wear property to resist catalyst erosion.

A split plate electronically welded to the vessel shell by means of a Nelson stud gun is used to hold the lining to the walls of the vessel. The solid end of the plate is welded to the wall, and the tines are bent apart about 45° (Fig. 1). These plates are attached in a herringbone pattern on 12-in. horizontal and 6-in. vertical centers. They provide sufficient surface for holding the lining in place. Vapor stops—narrow bands of metal welded to the interior surface — are also installed on 3-4-ft. centers.

The split plate studs are made from carbon steel except in those instances where it is necessary to weld them to an alloy lining, when they are made from 18-8 stainless.

The one-shot lining costs only about one-third of the cost of the usual lining and takes about one-half the time to apply.



SIMPLE STUD suitable for one-shot lining. Fig. 1.

New Cost Guide for Drillers provides

a common language of understanding among contractors.

Now they're among the best-informed managements in business.

By W. K. Powell
President A. & P. Drilling Co., Inc.
Duncan, Okla.

THE MANNER in which any industry regards its costs is an indication of the maturity of that industry. The new AAODC Accounting Manual is certainly a strong indication that the drilling-contracting segment of the petroleum industry has come of age. This recently printed book, the distillation of the best thinking in this group, demonstrates a fully developed consideration of the costs of drilling.

Deviating from the pattern of previous editions the new manual is definitely a technical book. It is written for and by accountants and cost engineers. A basic accounting and costing knowledge is required for the full and most profitable use of this guide. There is no longer any ambiguity in the professional language resulting from attempts to make the contents understandable to the lay reader.

Emphasis on Cost Accounting

With complete frankness the new manual places great emphasis on the most modern techniques suitable to the drilling business. It plunges into and offers a way of obtaining accurate unit costs in the same manner in which other advanced manufacturing groups have distilled their cost information. It does this on the basic premise that the drilling of oil wells on contract is nothing more than the operation of a gypsy factory which migrates from location to location in the process of producing its major product—a hole in the earth.

This concept makes complex the task of developing a satisfactory cost-accounting method for drilling. Consider the varying factors that might be met in constantly moving a shoe factory from one site to another while manufacturing 10,000 or 15,000 pairs of shoes at each location. New conditions, varying moving costs, and modifications in installation would all affect the cost of producing a pair of shoes.

However, the shoe manufacturer does not have to operate under these conditions. Nor does any other manufacturer except the drilling contrator. His operations are unique and require unique accounting adaptations.

Time unit . . . In approaching these peculiar problems the manual assumes that the most practical unit of production cost for drilling is one of time. It is feasible to determine the cost of operating a drilling rig, under defined conditions, with a high degree of accuracy.

The unit of time proposed is the rig contract day. This is defined as: "any 24-hour period during which work is being done that is pertinent to the whole drilling contract, and which requires the presence of the complete drilling rig manned with adequate crews for its preparation, operation, and disengagement."

The central theme of accounting in the new manual becomes a system for accurately determing the cost per rig contract day of operating given drilling rigs. Such cost units then become usable for forecasting future expenses or in estimating for the purpose of bidding. The methods recommended, also, enable the contractor to determine the over-all results of work done immediately upon completetion with great accuracy.

The speed with which results can be obtained in the evaluation of completed work and in establishing values for prospective work are of special value to the contractor during highly competitive periods. The diminishing profit factor has compelled the adoption of these refinements. Accuracy which comes a year late or a month late is of little value to the contractor when his current prices must be in tune with exact costs.

Cost Details Stimulate Savings

Additionally, the costing charts are completely flexible to permit the isolation of the smallest components of cost. This means that it is possible to ascertain the average daily cost of 1¼-in. manila rope if that degree of detail is useful. It is also possible to expand and contract, at will, the amount of detailed cost data being secured. This prevents the expenditure of accounting effort for unnecessary information.

The ability to secure accurate cost figures on the many smaller segments comprising the over-all daily cost of drilling enables the contractor to pursue a more intelligent economy program. The data resulting from the manual recommended records is comparable between different periods on the same rig and with that originating from similiar rigs for the same period. Thus the contractor can readily detect changing costs whether of an isolated or general nature.

For example, slush-pump repairs, on a particular rig, may appear high as related to those originating on other rigs. This establishes a clue to possible waste. Analysis of the cause of the differential may reveal a single, simple difference in operating care and maintenance causing the added expense. This can be such a thing as the overenergetic seating of valve replacements with the sledge hammer or the use of low-aniline-point oil-base muds.

On the postive side, any improvement is, also, quickly discernible. If the personnel of one rig devises or practices some action which results in lowered expense it will be indicated on the record. Such a reduction, being spotted through the cost accounts,

can be duplicated on other rig operations.

System Requires Serious Intent

While the manual is designed to afford the foregoing and other advantages, the use of its methods requires a high quality of professional work and serious intent. No greater amount of physical effort is needed to set up and to operate the recommended costing system. But, there is a strict necessity for accuracy and consistency which demands a higher degree of training and experience.

The accounting procedures must be thoroughly understood and adapted to the individual needs. Decisions on the allocation of expense components require wisdom and insight as well as a thorough practical knowledge of all drilling operations. The manual procedures anticipate high-quality personnel in the accounting department.

But, merely staffing the accounting department with the finest of professionals will not secure the full advantages of the costing system. The whole organization must understand and cooperate in making the system effective. To put on a man's clothes does not make one a man. The maturity of the individual organization is expressed in the manner in which every unit works for the common good of the whole.

No employe can fear the unit costing system if it is understood. It is not a yoke but a tool to be used by every person connected with management, however remotely. The purpose is not the isolation of personal deficiencies but to determine and improve on the most economical and efficient ways to drill wells

Time vital . . . Douglas Wright, in his fine article, "Know Your Time To Insure Your Profit," published in The Oil and Gas Journal of August 26, 1957, pointed out the close relationship of time accounting to dollar cost accounting. He correctly insists that the accurate and constant measure of rig employment in terms of activity time is essential to positive results from cost accounting.

This is one of the points wherein team work is demanded of the whole drilling organization. The driller needs to know exactly what records of time are expected of him. He needs to furnish such reports on a precise and constant basis. And it will help if he knows why they are wanted and can see the profitable results of their accumulation.

Thereafter, from the driller on, in and out of the accounting section, to the highest eschelons of management the same sympathetic understanding and cooperation must exist.

Specialized Drilling Problems

In recent years, numerous variations of the conventional land-based rotary drilling method have emerged. A substantial number of rigs are now drilling over waters of varying depths and distances from land. There has been a steady increase in air/gas drilling in certain areas. Revolutionary types of bits are evolving.

In recognition of these developments the manual carries a complete chapter dealing with specific problems in cost accounting relating to each deviation. The pattern also provides ways in which to handle future changes in drilling methods as yet unseen.

All of these specialized problems are solved with the same basic principles and techniques that are used for the more conventional work. New technical terms are incorporated with directions for handling their expense derivatives. The fundamentals are applied in exactly the same manner as with the older drilling methods. Only the details vary.

Indirect costs . . . As the indirect costs of depreciation of equipment and the overhead expense of administering a business are the least agreed upon of all portions of cost, the manual becomes quite explicit as to ways of determining this type of expense. There are concise discussions of several acceptable means of deriving depreciation expense factors and a complete exposition of all phases of overhead expense.

In keeping with the unit cost of accounting for other expenses the manual stresses the usefulness of calculating depreciation expense on the same standard rig contract day with modifications for inactive time. The establishment of rate factors must rely upon historical experience and on the good judgment of qualified operating and management personnel. To this degree use depreciation is similar to all other forms.

An estimate of the actual useful life of the equipment in terms of operating time must be made. But, since wear and tear from operation contributes the major part of normal depreciation the application of the unit of cost to the day of operation reduces the inherent errors of calendar computation which disregards the degree of rig activity.

Drill-pipe depreciation . . . A special method of accurately computing drill-pipe depreciation costs is explained. This involves recording the employment of drill pipe in terms of foot-days. For this purpose, a foot-day is defined as 1 ft. of drill pipe in service for one 24-hour day. By deducting the remaining value from the starting value of drill pipe over a definite period the aggregate cost of the pipe used up can be determined. Dividing this amount by the total foot-days for the examined period results in a depreciation cost per foot-day.

The manual calls attention to the changing concept of base values used in the computation of depreciation. The cheapened dollar has resulted in inadequate reserves for the replacement of equipment when the reserves have been accumulated on the recovery of the initial cost of the goods.

Although the principle is not yet recognized for tax purposes it is considered imperative by the drafters of the manual that provisions be made to recover correct and ample depreciation funds by basing the depreciation calculations on the cost of replacement of equipment in terms of today's market.

The implication of this recommendation is, once more, that tax accounting has become unrealistic. The drilling business is almost required to keep two sets of records. One set of books must coincide with the rigid and unreal requirements of tax regulations. An unbiased costing system needs to be maintained in order to correctly establish the real results of operations and to guide management in the hazardous business of contracting.

Indirect expense includes overhead costs. These are the general expenses of running and administering the business. Provisions are made for the large organization which delegates some of the functions from its central office to field or division offices. The chart of accounts and the details of the chapter which covers this subject are sufficient to enable any size company to correctly allocate and apportion the expenses of this nature.

Oil and Gas-Production Accounting

A majority of drilling contractors have or will have some amount of oil and gas production. Because of this, the master chart of accounts included in the manual is designed to be in harmony with the procedures recommended by the API. A full chapter is included to give the contractor the basic principles of production accounting and a framework for the handling of production within the system presented for contract drilling.

Depletion is treated in the chapter on production accounting rather

than under the general subject of indirect expenses. Statements on this subject are precise and coincide with the best thinking in the industry. Procedures are outlined for the computation and allocation of depletion expense and reserves. The charts which serve as guides for this purpose are indexed in a similar manner to the API system of accounts.

History of the manual . . . The present manual is the cumulative result of many years of work. In October 1944, the first manual was authorized by the AAODC at its annual convention at Fort Worth. Instructions called for the accounting committee to produce a book which would aid the accountant in proper bookkeeping methods for the drilling industry but required that the text be comprehensible to the layman and simply instructive to the beginner.

This was to be a training book as well as a guide for professionals. For this reason, a costing guide was made a part of the project.

All materials and services that might be used in the conduct of business were arranged alphabetically and indexed for appliction to the proper accounts under three columnar headings for rotary tools, cable tools, and well servicing. A fourth column was left blank for private index numbers if the user did not choose to employ those recommended by the association.

The costing guide was highly successful in developing consistency and in the training of personnel unfamiliar with the terms of the industry. Because of this, it has been regularly revised and expanded and appears as an integral part of the new manual.

Work was accomplished by the committee members assembling examples of all known systems in use. A digest was made of this material by a group of experts. From this report the best features were extracted and welded into a workable new system. This plan was incorporated into what became the original manual adopted by the association on October 1, 1945.

When it became apparent in 1950 that the original text was becoming badly outmoded a revision was authorized. This revision was accomplished in much the same manner as the construction of the original manual except that the committee then had the accumulated files of criticisms and materials which had been carefully garnered from the time the original book was issued. The requirements of presentation remained the same so the revision continued as something less than a wholly technical book.

Both early editions served their purpose well and helped the drilling industry in making great strides towards uniformity of accounting and understanding. Having accomplished this the time became right for the construction of the new manual as an advanced and professional text on cost accounting for the drilling industry.

Conclusion

This new guide for the drilling industry is a tribute to the willingness of the members of this group to pull themselves up by their own bootstraps. There was no standard accounting system for drilling operations so they made one. Twenty years ago there was no common language of understanding between contractors regarding their costs so they created one. In less than 15 years they have advanced themselves to a place among the best-informed managements in business. They have matured and their new manual is visible, tangible evidence of their maturity. **End.**

BOOKS

A SMPOSIUM ON THE OIL INDUSTRY OF THE PERMIAN BASIN. Bulletin No. 58, the Proceedings of the Tenth Oil Recovery Conference of Texas Petroleum Research Committee, held in Midland, Tex., April 18 and 19, in cooperation with Permian Basin Section of the Society of Petroleum Engineering of the A.I.M.E. 144 pp. $1.00.

This book is a paper-bound volume containing 15 papers by well-known petroleum engineers. Topics such as interpretations of well logs from carbonate rocks, reservoir performance, the performance and analysis of Permian basin oil fields, interpretation of core analysis in the Permian basin, and various new techniques used in completing wells in the Permian basin are discussed. The volume is replete with illustrations, charts, graphs, and tabulations of data. Attention is paid to the important economic subject of well performance. Address Director, Texas Petroleum Research Committee, Room 201 P.E.B., University of Texas, Austin 12, Tex.

CONTROL VALVES. By Chester S. Beard. Published by Instruments Publishing Co., 845 Ridge Avenue, Pittsburgh 12. 222 pp.

This book was written to furnish descriptions of the variety of valves and actuators available for use by the instrument engineer or plant operator.

Throughout the book, the numerous body designs are designed with little reference to actuators; the variations in approach to actuator design are covered with little reference to the body.

This has been done, the author explains, because in many cases the engineer may select one of many actuators to position the valve of his selection.

Emphasis is placed on the actuator because it has, in addition to its use with a control-type body, a wide application for positioning other pieces of equipment.

The inspection of electronic control systems and the need for high-powered fact acutuators have added impetus to the redesign of electrical actuators and electrohydraulic units.

ROCKS ASSOCIATED WITH THE MISSISSIPPIAN-PENNSYLVANIAN UNCONFORMITY IN SOUTHWESTERN INDIANA. Published by the Indiana Department of Conservation, Geological Survey. Field conference Guidebook No. 9.

This publication includes remarks from the field conference guidebook No. 9 associated with the Mississippian-Pennsylvanian unconformity in southwestern Indiana, and Mineral Economics Series No. 3, oil development and production in Indiana during 1956, by T. A. Dawson and G. L. Carpenter.

OIL AND PETROLEUM YEAR BOOK, 1957 edition. Published by Walter E. Skinner, 20 Copthall Avenue, London, E.C.2. 765 pp. $6, postage free abroad.

This is the forty-eighth year of publication for this standard reference which gives complete particulars of organization for 1,070 oil companies operating in all parts of the world, and covering all branches of the industry. Information includes names of directors and officials, description of business, where operating, crude-oil production, refinery runs, details of capital, dividends, and financial results.

The book also contains Manager's, Engineers and Agents Section; World Crude Oil and Natural Gasoline Tables; and Buyers' Guide Section.

New features include maps showing: Canada's oil and gas fields and pipelines; Trans-Canada natural gas transmission system; Middle East oil fields, refineries, pumping stations, and pipelines.

DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS by N. Irving Sax. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22, N. Y. 1,467 pp., $19.50 to Dec. 31, 1957; $22.50 after Jan. 1, 1958.

This book is an entirely rewritten and greatly expanded version of the original work on this subject. It includes information on more than 8,500 materials. Sax was assisted by five other men in compiling the volume.

The book gives encyclopedic information on the hazards of general chemicals and industrial materials. It also contains important safety information in comprehensive text sections. Chemists, engineers, or nontechnical personnel can find quickly whether a given compound or material is potentially dangerous and what precautionary measures must be taken.

REVIEW OF GEOPHYSICAL ACTIVITY IN KANSAS THROUGH 1956, by William W. Hambleton and Daniel F. Merriam. State Geological Survey of Kansas Bulletin 127, Part 1. Available from University of Kansas Publications, Lawrence, Kans. 24 pp.

This bulletin contains a complete bibliography of 52 published geophysical papers on Kansas, along with a brief description of each. In addition, geophysical exploration in the state for the past 20 years is reviewed. The principal methods—seismic, gravity, and magnetic—all have been used successfully in Kansas. Electrical studies and radioactive studies also have seen limited use.

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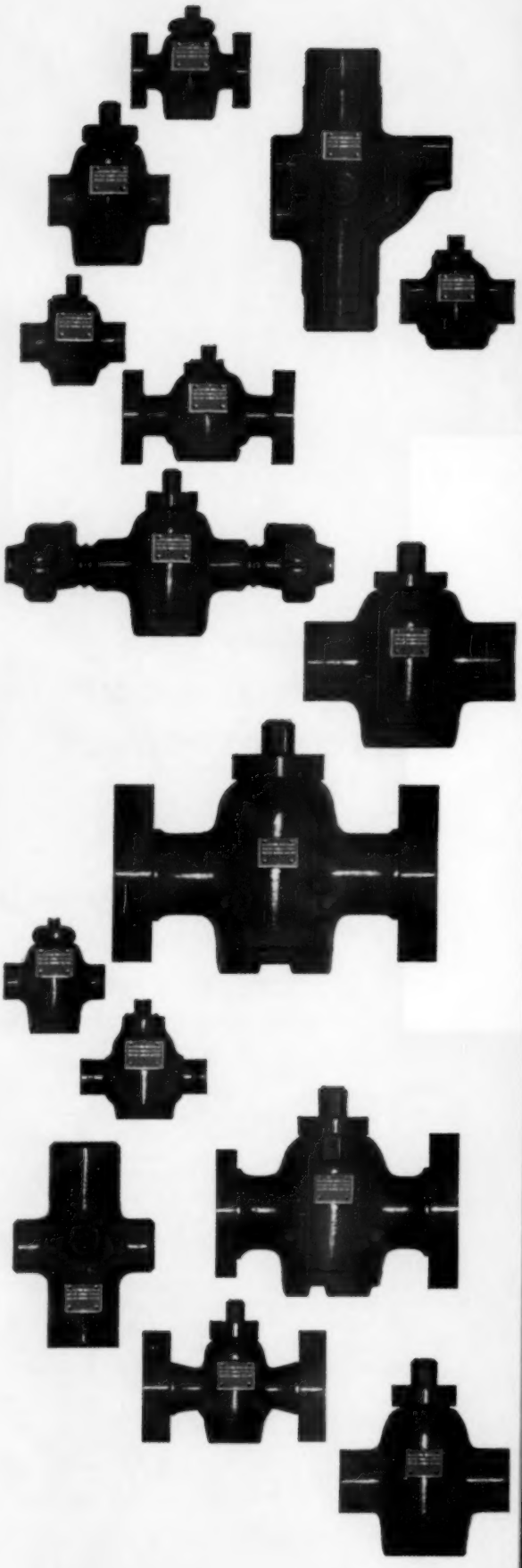

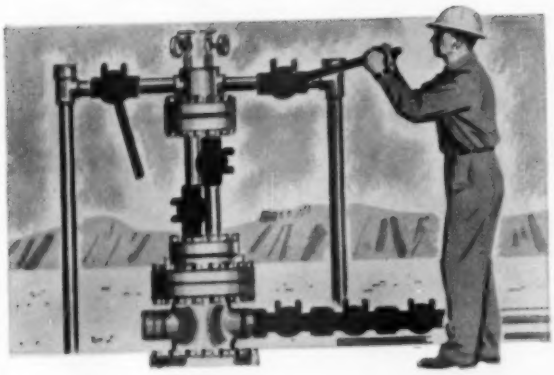

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Gas from an offsetting injection well was invading a producing well, lowering production and shooting gas-oil ratio skyhigh. The cure . . .

Open-Hole Packers Shut Off Gas

By Ed McGhee
District Editor

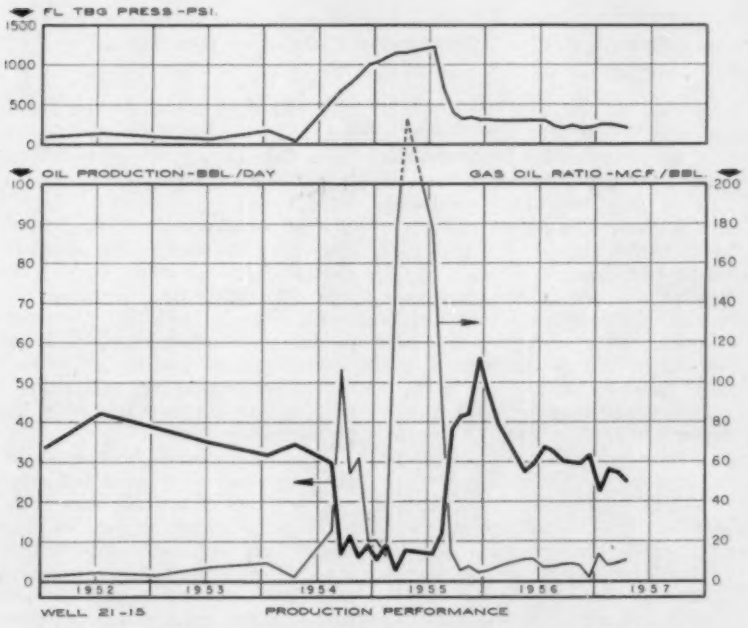
GAS channeling from injection to producing well is a problem in many repressuring projects. It happened in Fullerton Clearfork Unit; gas reached the producing wells faster in one stratum than in others. As a result, gas-oil ratios jumped and oil production sagged. The trouble was cured with open-hole packers. The idea could be used elsewhere in gas-injection projects and where a gas cap is open to the well bore.

Fig. 1 is the production history of Fullerton Clearfork Unit's Well 21-15. As the map in Fig. 2 shows, this well offsets a gas-injection well in the big Fullerton field of Andrews County, Texas.

Gas injection in Section 21 of the field began in July 1954. As Fig. 1 shows, Well 21-15 got a "kick" almost immediately afterwards. By the end of the year, gas-oil ratio had climbed out of sight and oil production dropped to less than 10 bbl. per day. During this same period, the reservoir pressure in Well 21-25 increased from 738 to 1,518 psig. Obviously, gas was channeling from injection to producing well.

Of course, low production costs unit members in current income. And, the channeling was a waste of both compression cost and reservoir energy. Besides, the channeling gas might backflow into the oil zones of the producing well. If so, this could drive the in-place oil back away from the well bore and some of it might never be produced in primary recovery.

In the offsetting injection well, the interval open to the well bore was the "lower reservoir" which has a gross thickness of 200 ft. In it, there are two distinct producing zones, each with streaks of varying porosity and permeability.



PRODUCTION HISTORY of Fullerton Clearfork unit's well 21-15. Fig. 1.

Locating gas entry . . . Engineers of Monterey Oil Co., operator of the Fullerton Unit, decided to try to locate point of gas entry into the producing well by means of a temperature survey. The temperature log records at the surface the straight temperature gradient as well as the differential temperature, from one end of the tool to the other.

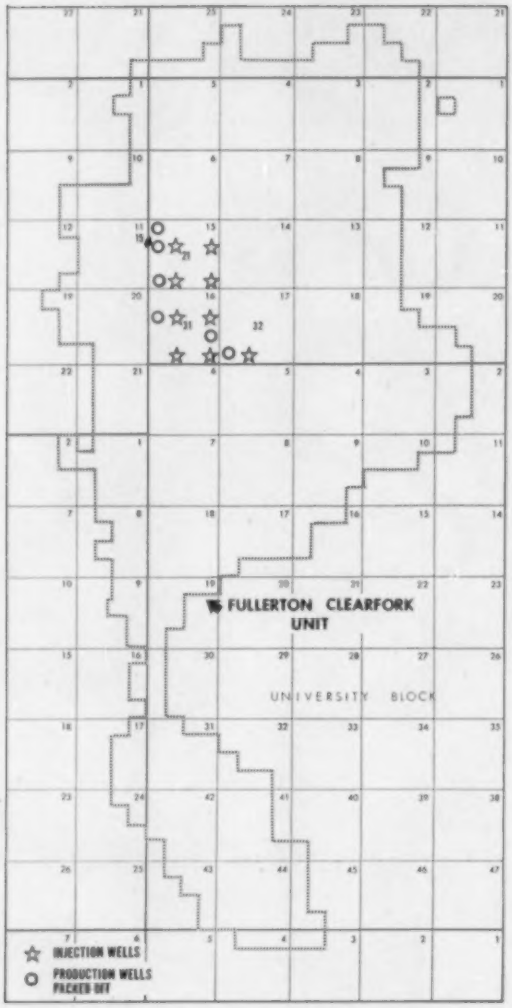
Well 21-15 was killed and the tubing pulled. Then the tubing was fitted with a seating nipple on bottom and run to total depth. To make sure the well would flow through the annulus, it was swabbed down. Afterwards, a retrievable standing valve was pumped down the tubing until it landed in the seating nipple. This standing valve was chased with fresh water. Fresh-water fill in the tubing is a better conductor than a gas column, so it will give a more reliable log.

After the well had been shut in for 16 hours, Runs 1 and 2, shown in Fig. 3, were made with the temperature survey. Notice the "kick" in the curves at 6,840 ft.; note also the displacement to the left from 7,200 ft. to bottom. These curves made it appear that the zone at 6,840 ft. might be the location of gas breakthrough.

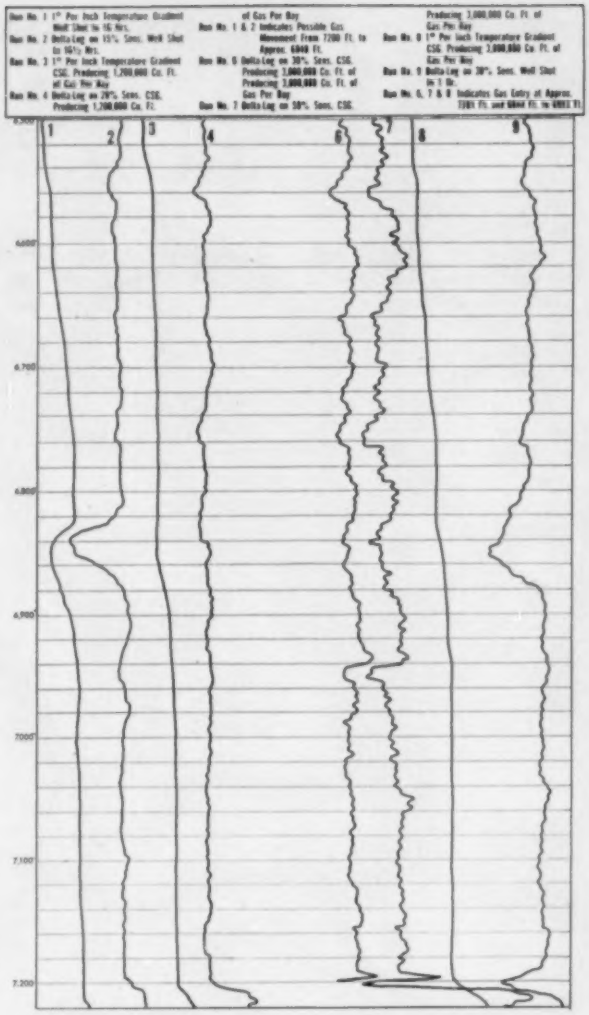
Then, the well was opened up without a choke to produce through its flowline into the tank battery. Because of the small size of the line and its great length, back pressure on the wellhead never fell below 1,100 psi. although the well was making an estimated 1,250 M.c.f. per day. Curves 3 and 4 in Fig. 3 were taken while the well was flowing at this rate.

The rate of flow was too low to cause much expansion cooling by the gas entering the well bore. As a result, there was no indication as to where gas was coming in.

Flow to atmosphere . . . To get a higher flow rate, a test separator was set at the location and the produced



WELL 21-15 offsets a gas injection well in the big Fullerton field of Andrews County, Texas. Fig. 2.



TEMPERATURE LOG of well 21-15. Fig. 3.

gas vented to atmosphere. With this arrangement, flow rose from 3,000 M.c.f. to 5,000 M.c.f. per day and wellhead pressure fell to about 500 psi.

After waiting 1 hour for the temperature to stabilize, Runs 6 and 7 on the temperature log were made. These runs showed that gas breakthrough was at the 7,200-ft. depth; apparently there was also a small gas entry at 6,950 ft.

Well 21-15 was shut in for an hour and the final runs, 8 and 9, were made. Notice again on Run 9 the kick at 6,840. Monterey engineers concluded that this kick was due to "thiefing" by a permeable zone at that depth. Gas was entering the well at 7,200 ft. and backflowing into the zone at 6,840.

Run packer in open hole . . . On the basis of the temperature survey, Monterey ran an open-hole packer into the well. Ordinarily in Fullerton field, the company had found that the open-hole sections remain clean and close to gage even after producing several years. The packer run was a Sweet model MG-100 for setting in 4¾-in. hole.

There was no caliper survey nor core analysis by which to pick a packer point. So, Monterey picked the first dense zone above point of gas entry, based on sample description.

This workover was completed in September 1955. Within a month, production was back up to 49 bbl. of oil per day and gas-oil ratio down to 3,700 cu. ft. per bbl., flowing on an 18/64-in. choke. Tubing-head pressure, which had been as high as 1,200 psi. before workover, was down to 325 psi.

As Fig. 1 shows, the oil-producing rate has stayed up until now. Gas-oil ratio stabilized at about 6,000 cu. ft. per bbl. through February of this year. Current ratio is only 10,000 cu. ft. per bbl.

Worked on other wells, too . . . Monterey has performed similar open-hole packer jobs on six wells. Each of the jobs was successful. Moreover, 12 injection wells have the formation packers to restrict gas injection to the lower Clearfork reservoir. In spite of surface pressures as high as 2,200 psi., only one of the injection wells has given trouble.

Recently, Fullerton Unit began injecting gas into both upper and lower reservoir in the same well. Here again, a formation packer is used in open hole to keep the zones separated. Tubing-head and casing-head pressures have been watched closely for any sign of packer leakage; thus far, there has been none. **End.**

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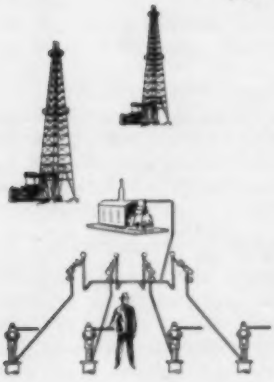

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MAKING BUTADIENE—3

Butane Dehydrogenation today employs fixed-bed methods

Tomorrow's butane-to-butylene dehydro methods may use fluid-bed and moving-bed techniques. Tie-in between the steam-dilution method (butylene dehydrogenation) and the Houdry adiabatic or Phillips isothermal butane dehydrogenation is explained here.

By John C. Reidel
Petrochemical Editor

SOME of the experimental work done in past years on paraffin dehydrogenation, and on butane hydrogenation specifically, is detailed in References 14-21.

Beesley and Whipp[20] have described the Imperial Chemical Industries plant built at Billingham, England, during 1939-40 for the manufacture of isooctane. The plant had a capacity (butylenes) of 13,500 tons per year made by dehydrogenation of butanes (about 70 per cent isobutane) obtained as byproduct from coal hydrogenation. The resulting butylenes were polymerized to dimers (octylenes) and these hydrogenated to isooctane.

The dehydrogenation unit was based on a process developed by UOP.[19] using chromia - alumina catalyst. UOP dehydrogenation units similar to the ICI unit were also constructed by Premier Oil Refining Co. at Cotton Valley, La., and Great Southern Chemical Corp. at Corpus Christi, Tex. The catalyst was later improved at Billingham, taking the form of a chromia - alumina mixture of high chromium content promoted with alkali compounds. UOP solved the heat-transfer problem involved in supplying the high endothermic heat of reaction by using a large number of long heated catalyst tubes of smaller diameter to obtain high gas velocities. Reactors consist of 96 vertical catalyst tubes 2⅞ in. i.d. and 14 ft. long. Beesley and Whipp state that a considerable portion of plant capacity at present goes to make diisobutylene and butylated tar acids.

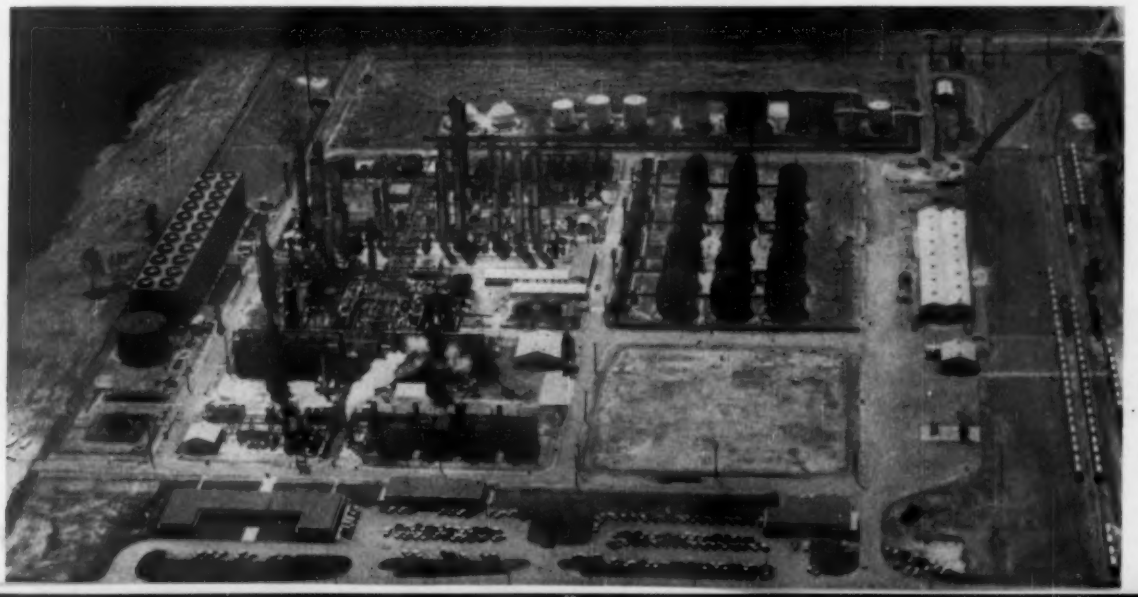
The Billingham plant operates in a cycle with 1 hour on stream and 1 hour reactivation. Heat of reaction is supplied by hot flue gases. The feed of fresh and recycle butanes is preheated to around 1,100° F. and dehydrogenation takes place at about 1,050° F. at inlet reactor pressure of 100 psig. and a pressure drop through the catalyst tubes of about 70 psig. Average conversion per pass of butanes and butylenes is 22.5 per cent at butylene efficiencies (number of moles of butylene made per 100 moles butanes destroyed) at 85-90 per cent.

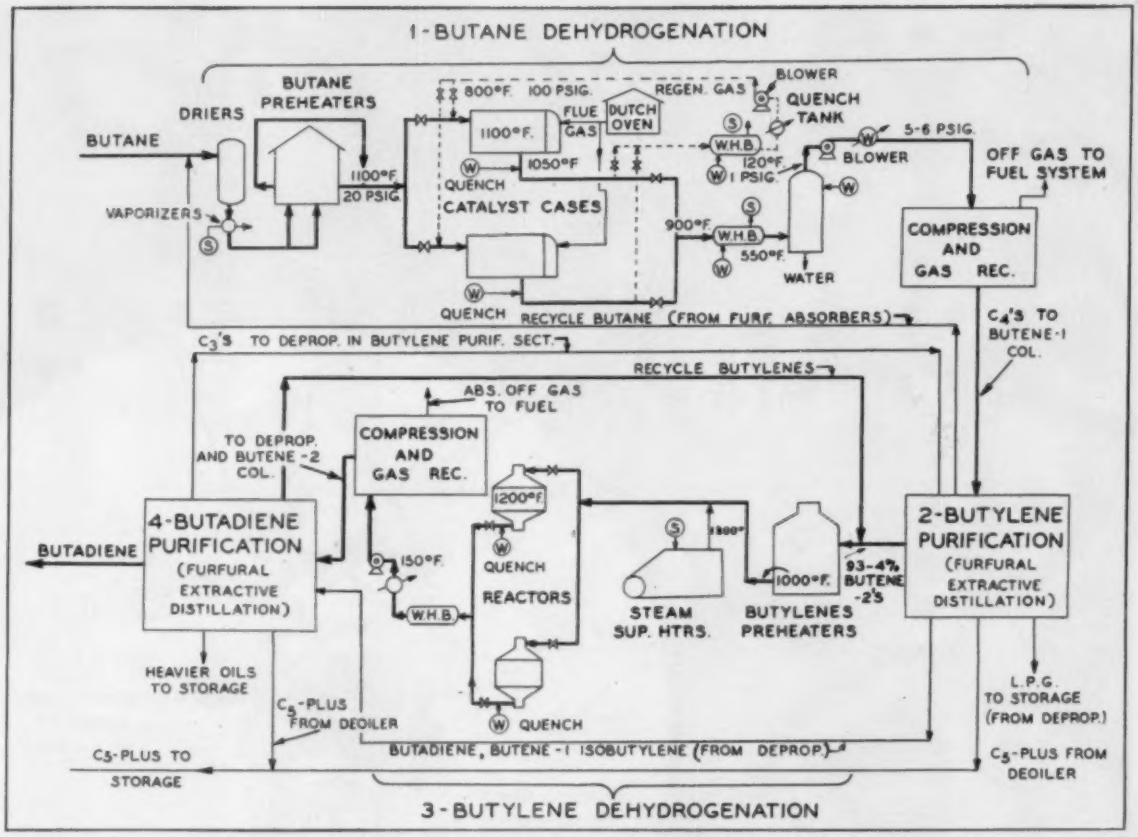
The same type of facilities was operated for the Government by Great Southern at Corpus Christi. These facilities were subsequently bought by Great Southern but are not in operation now.

Phillips Two-Stage Process

Hachmuth and Hanson[22] reported results in pilot-plant work on dehydrogenation of butane to butylenes with several catalysts. The major part

TEXAS BUTADIENE & CHEMICAL'S new 80,000-ton Lyondell butadiene plant at Channelview, Tex., near Houston. Houdry dehydrogenation units run in conjunction with an alkylation unit at this plant.





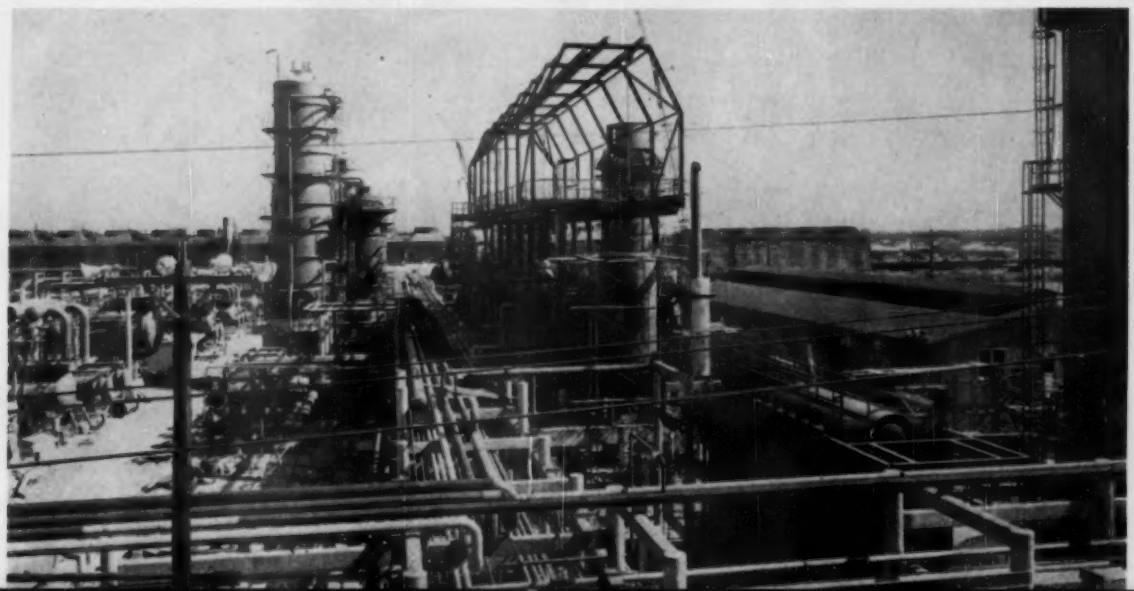
DEHYDROGENATION OF BUTANE—Phillips two-stage process at Borger, Tex., dehydrogenates butane in a multitubular (isothermal) reactor. The resulting butylenes are dehydrogenated to butadiene by the steam-dilution (adiabatic) process. Fig. 2.

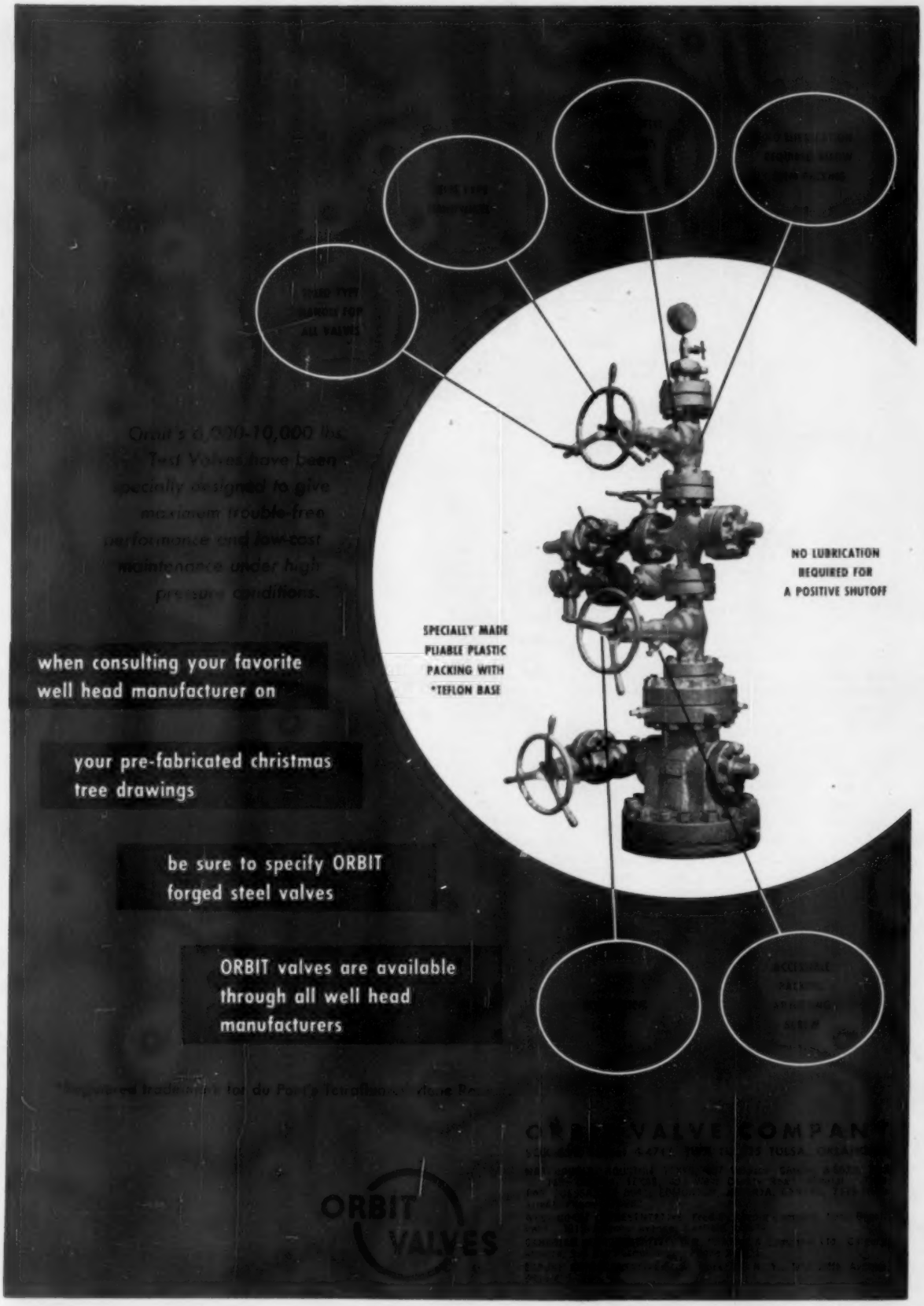
of the work was done with three chromia-alumina catalysts. The reactor units built by Phillips at Borger to carry out this dehydrogenation has been described by Hanson and Hays.[23]

Fig. 2 is a boiled down version of the over-all process at Borger. A somewhat more detailed flow sheet was published previously.[24] The over-all Phillips process may be visualized as consisting of four steps: (1) butane dehydrogenation, (2) butylene recovery and purification, (3) butylene dehydrogenation, and (4) butadiene recovery and purification. Steps 2 and 4 are accomplished by extractive distillation with furfural.

Butane dehydrogenation (isothermal) . . . Feed stock is a highly pure n-butane (98 LV per cent or better) which is sent through bauxite drying towers. It is mixed with recycle butane and the mixture vaporized and superheated in gas-fired tubular heaters to 1,100° F. The feed then passes through the multitubular catalyst cases half of

AT PETRO-TEX plant, new facilities employ Houdry dehydrogenation.





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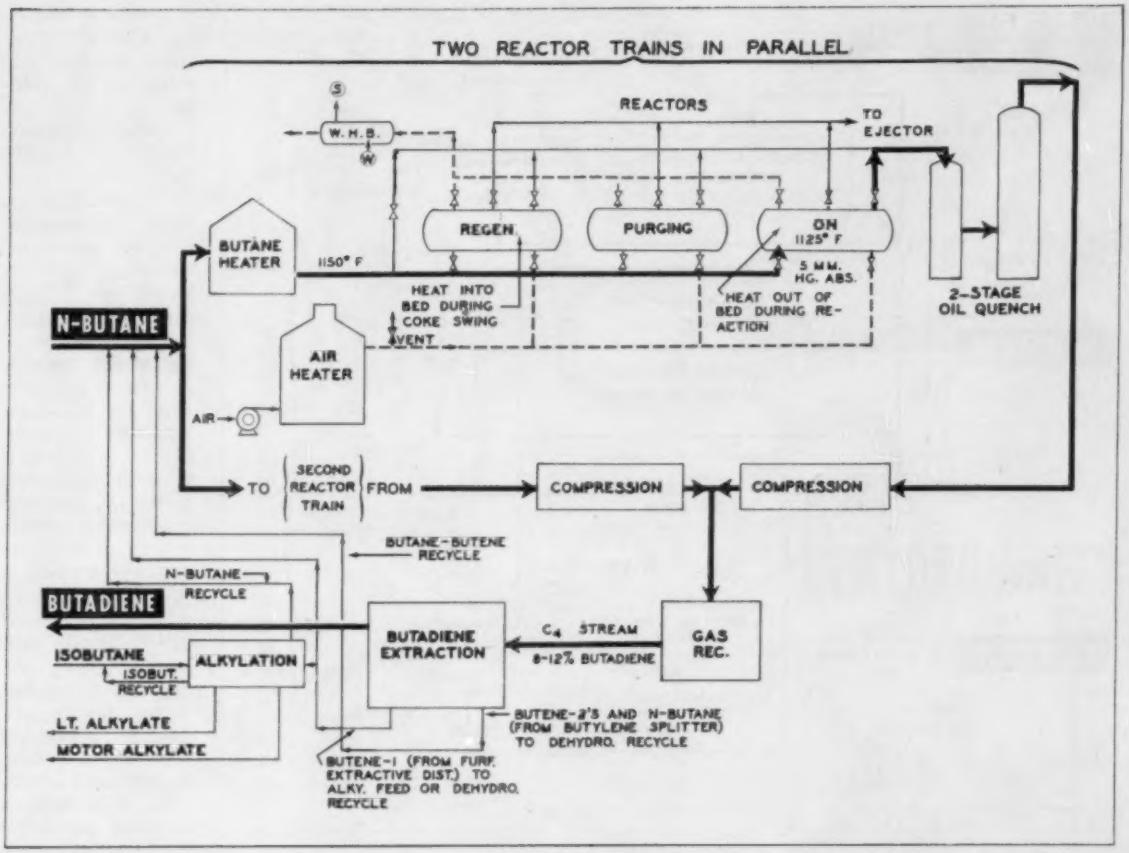


HOUDRY ONE-STEP, showing utilization of butylenes in alkylation as practiced by Texas Butadiene & Chemical Co. Actually the TB&C installation includes seven reactors in each train—three regenerating; three on stream; one purging, evacuating or changing valves. Fig. 3.

which are on regeneration while the other half are on dehydrogenation. Each catalyst case contains several hundred tubes, 2 in. in diameter and 10 ft. long, curved inward toward central headers in the form of a harp. Flue gas from a Dutch oven provides the heat of reaction. Regeneration gas is supplied at 100 psig., but pressure is reduced for the dehydrogenation step by bleeding out through the stack.

Reactor effluent is quenched with water at the reactor outlet, goes through a waste-heat boiler, is quenched again down to approximately 120° F., and goes to the butylene purification section.

Butylenes dehydrogenation (adiabatic) . . . The butene-2's concentrate stream from the butylene purification section, together with recycle butylenes from the butadiene purification section, is preheated to 1,000° F. and mixed with 1,300° F. superheated steam. Butenes dehydrogenation at Borger presently is conducted with the improved Phillips 1490 catalyst.

IR analyzer . . . Kratochvil and Berger[25] describe the use of an IR analyzer to monitor the CO_2 content during regeneration of the catalyst in experimental work. This was employed during some experimental runs with Dow catalyst. It provided a continuous and highly accurate CO_2 analysis which aided in obtaining uniform regeneration from cycle to cycle and so helped maintain an improved conversion level.

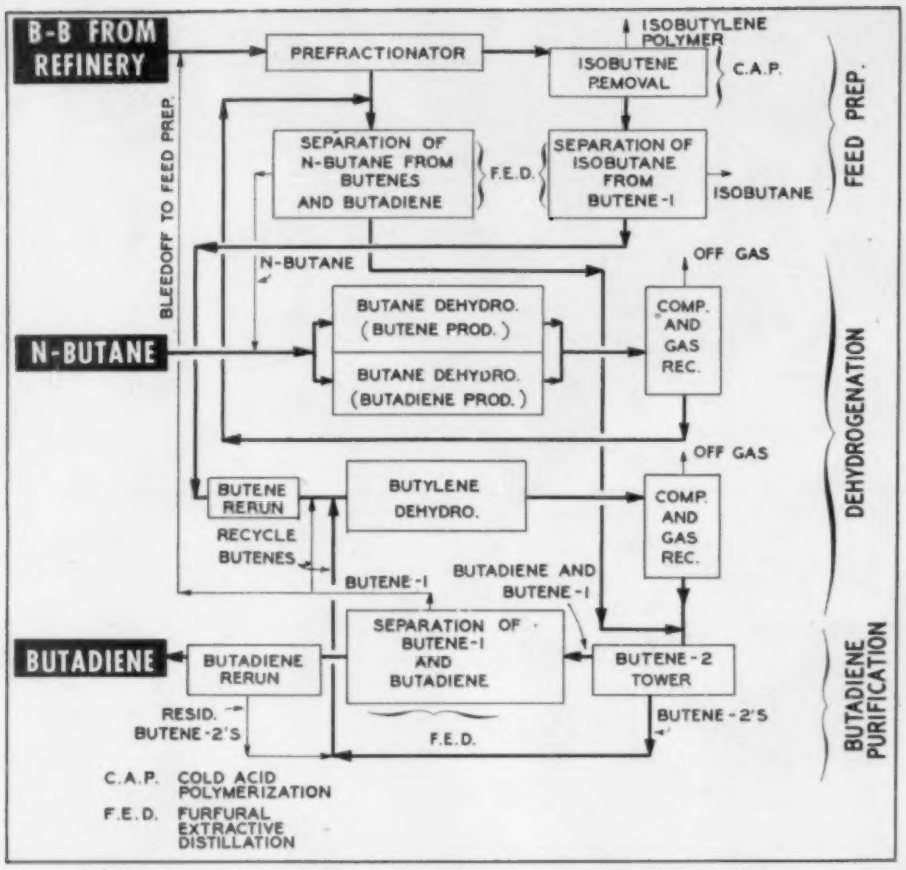
Houdry One-Step Process

Lassiat and Parker[27] outlined the operating principle of the Houdry butane hydrogenation. Hornaday and Cicalese[28] have presented costs for this process.

The catalyst is an activated alumina impregnated with 18-20 per cent of chromic oxide. Catalyst life is roughly 6 months. The reactor is a horizontal steel shell lined with ceramic tile. Contamination of the catalyst with even small amounts of iron oxide must be prevented since this promotes formation of large quantities of coke and gas. Newer catalysts developed by Houdry are expected to have considerably longer life.

Heat-balance unit . . . The catalyst in the form of cylindrical pellets is mixed with an excess of alundum particles. This catalytically inert material provides a large surface area (heat sink) that makes possible rapid heat transfer (small temperature differences) between the gas phase (reactants or regeneration gas) and the solid phase (alundum particles and catalyst). Note that in speaking of the "large surface area" of alundum we are referring to "heat sink" properties and not to BET surface area which refers to the Brunauer, Emmett, and Teller multilayer catalysis theory.[28a]

During the "coke swing" (regeneration) the alundum absorbs heat and the bed temperature goes up. During dehydrogenation the bed temperature goes down as heat is given up to the reaction. Preferred operation is that in which heat of reaction is slightly greater than heat of combustion—i.e., so that the temperature of the catalyst bed does not get too high during regeneration but that the heat storage provided is sufficient to supply the heat of reaction. To accomplish this



TIE-IN at Petro-Tex Chemical Corp. of original butylene dehydro facilities (steam-dilution process) with new Houdry butane dehydro units at the Houston butadiene plant. Fig. 4.

an excess of air above combustion requirements must be provided during regeneration and the reactant and regeneration air temperatures carefully controlled to obtain the desired operating temperature.

React-purge-regenerate . . . A three-reactor unit is shown in Fig. 3 with one reactor on stream, a second undergoing vacuum purging and valve changes, while a third is being regenerated with preheated air, the whole operation being regulated by a cycle timer. Purging by means of a steam ejector follows the regeneration step. The on-stream period is a short one—between 7 and 15 minutes, but normally 8-10 minutes. With short on-stream periods the temperature variation during the cycle can be limited to less than 50° F. This permits maintenance of the temperature within the required optimum for high conversion level. And the frequent regenerations keep the coke down to allow over-all high catalyst activity.

Note that two of the new Houdry installations which have recently come on stream (Petro-Tex and Texas Butadiene & Chemical) employ two parallel groups with seven reactors in each group. Three reactors are on stream, three on regeneration, and one is purging, evacuating, or changing valves at any one given time. The master cycle timer for each reactor train goes through a 21-minute cycle. Each reactor is 9 minutes on stream, 9 minutes regenerating, 1½ minutes on purge and evacuation steps, and 1½ minutes switching valves.[20] Firestone employs one group of five reactors.

Odessa Butadiene Co. employs eight reactors — three on dehydrogenation, three regenerating, and the other two switching. The cycle length here is therefore 18⅔ minutes.

Butadiene - butenes . . . One-stage operation for maximum butadiene production is conducted at approximately 1,100° F. and low pressure. Butadiene yield is 8-12 per cent (by weight) at selectivities of 52 weight per cent or better. The Houdry process may be operated for higher butene and/or isobutene production from the respective normal and isobutanes, with reduced make of butadiene. This operation is conducted at essentially atmospheric pressure (about 10 psig).

Typical yields for the Houdry dehydrogenation, for production of butadiene only and for production of butadiene and butene, are given in the following tables (figures are per cent by weight). Improvements in design and new improved Houdry catalyst has led to better selectivity for both butadiene and butene production.

TABLE 4—PRODUCTION OF BUTADIENE

	Fresh feed % wt.	Recycle % wt.	Total feed % wt.	Reactor product % wt.	Ultimate yield % wt. butane fresh feed
Hydrogen				1.9	10.1
Methane				1.0	5.3
C_2				1.1	5.9
C_3				1.1	5.9
Isobutane	0.5	(*)	(*)	(*)	
Isobutene		(*)	(*)	(*)	
n-Butene		41.4	33.6	33.6	
n-Butane	99.5	57.9	65.8	47.0	
Butadiene		0.7	0.6	11.1	55.8
C_5+				0.5	2.7
Coke				2.7	14.3
Total	100.0	100.0	100.0	100.0	100.0

*Included in n-C_4 fractions.

TABLE 5—TYPICAL COMMERCIAL DATA (*HOUDRY DUAL-PURPOSE OPERATION), PRODUCTION OF BUTADIENE AND BUTENE

	Weight per cent		
	Total reactor feed	Total reactor product	Calculated ultimate yield wt. pct. of butane feed
Hydrogen		1.5	4.5
Methane		2.5	7.4
Ethane-ethylene		2.3	6.9
Propylene		2.2	6.5
Propane		0.4	1.2
Isobutane	2.0	1.4	...
Isobutene) and Butene-1)	†1.5	9.7	24.4
Butadiene	0.4	8.4	23.8
n-Butane	83.9	50.9	...
Butene-2	12.2	19.2	20.8
C_5+	...	0.3	0.9
Coke	...	1.2	3.6
Total	100.0	100.0	100.0

*Yields are average of daily yields for 1 week, taken after several months of plant operation. †In this operation, butene-1 and isobutene are selectively removed as product. When maximum butadiene is desired, all butenes are recycled to the process.

New Houdry data . . . The Houdry process yields, for butadiene production only, as given in Table 4 are based on the earlier operation.[28] Houdry yields in dual-purpose operation (for production of butadiene and butene) are given in Table 5. These are based on operating data from the newer installations rather than the El Segundo unit.

No data are given for production of butene alone, since to date no commercial unit is officially being operated this way, and only laboratory data are available at this time.

Butenes to alkylation . . . Following oil quench, the reactor effluent goes to compression and gas recovery and to butadiene recovery by CAA or by furfural or other extractive distillation. The process scheme shown in Fig. 3 is such as adopted by Texas Butadiene & Chemical Co.—with some of the butenes diverted to an alkylation unit. An earlier report had stated that TB&C would include a separate butane splitter to fractionate field butanes. This, however, is not the case, since TB&C has only the butane splitter normally used in an alky plant—there is no splitter for field butane.

Butane-butene dehydro tie-in . . . Mention has been made of the "tandem" operation between Standard Oil Co. of California at El Segundo using the Houdry process and Shell Oil Co. at Torrance using the steam-dilution method. Another such tie-in between these two processes but within the same plant, is employed by Petro-Tex (Fig. 4). To existing butylene dehydrogenation facilities Petro-Tex added butane dehydrogenation units, thus more than doubling its butadiene capacity. Furfural extractive distillation, as employed by Petro-Tex, is indicated for the feed-prep and butadiene-finishing steps in Fig. 4.

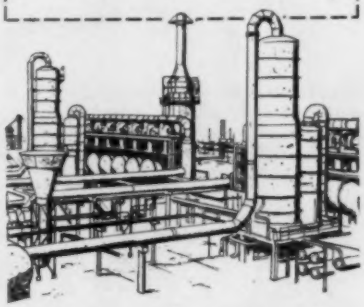
Summary—Dehydrogenation Processes

1. **The steam-dilution process** is the established process for n-butylene dehydrogenation. This method still accounts for the major portion of today's butadiene capacity. Future use of this process will be limited by: (a) refinery butylene availability, and (b) the extent to which competitive economics will permit it to be coupled with butane dehydrogenation in a two-step process. The steam-dilution method can stand some improvement in the directions of minimizing steam consumption and maximizing butylene utilization. The Dow catalyst gives higher selectivity and conversion than the Shell catalyst but requires greater quantities of steam. Greater quantities of acetylinic and carbonyl compounds are formed over Dow catalyst. The Shell catalyst is a very rugged catalyst. Dow catalyst is much more sensitive but problems involved in its use have been fairly well solved. The Shell catalyst requires a minimum of regeneration since it catalyzes the water-gas reaction during dehydrogenation to hold down the coke buildup. The Dow catalyst requires periodic regeneration with air and steam. The higher selectivity and conversion of the Dow catalyst permits capital savings, especially for completely new facilities, which must be balanced against operating costs of a particular plant location.

2. **The Phillips two-stage** dehydrogenation has the advantage of em-

on stream in the United States

TWO NEW HOUDRY DEHYDRO UNITS



Texas Butadiene & Chemical Corporation
Houston, Texas

T.B.&C. is the first company to produce both butadiene and alkylate from the same feed. These new units, which use Houdry Dehydrogenation Catalyst, have a nominal combined design capacity of 86,000 ton/yr of butadiene—or 65,000 ton/yr of butadiene plus enough butene for 2.5 million barrels of alkylate.

The Houdry Dehydrogenation Process is the only commercial one-step process for transforming butane to butadiene or butene. Investigate it for maximum economy and flexibility. Write for information.

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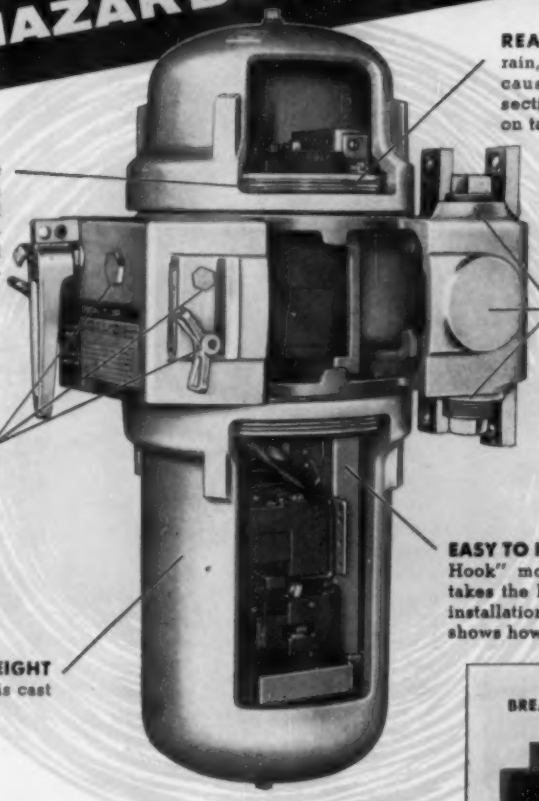


REAL PROTECTION against rain, dust, dirt and weather because male threads on collar section engage female threads on tank.

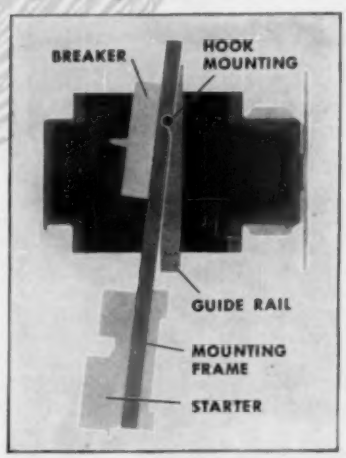
DAMAGE-RESISTING Acme thread. If you've struggled with "banged-up" threads, you'll appreciate this feature. It's always a breeze to put on and take off tanks for installation, inspection or maintenance.

INCREASED WIRING SPACE and through-feed conduit entrances for horizontal tap-offs.

EASY TO ADD pushbuttons or selector switches with easy-to-buy, easy-to-use "off-the-shelf" parts kits.

EASY TO INSTALL • "Slide and Hook" mounting arrangement takes the hard work out of the installation job. Diagram below shows how.

STRONG and LIGHTWEIGHT The complete enclosure is cast aluminum.



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ploying butane feed. However, in the first stage (butane dehydrogenation) the heat-transfer problem requires the use of many catalyst tubes and additional equipment for generating and circulating flue gas to maintain conditions approximately isothermal. In the second stage (butylene dehydrogenation by the steam-dilution method) Phillips employed its improved 1490 catalyst. This catalyst has now been in use at Borger for over a year without requiring regeneration.

3. **The Houdry one-step** method also employs butane feed and has the added advantage of being a one-stage dehydrogenation. The Houdry process permits considerable flexibility in manufacture of butadiene or butenes.

Tomorrow's Processes

Processes operating on butane feed will be increasingly important since indications are that more butylenes may be going to motor-fuel upgrading.

● **Greatest incentive** still remains for development of an efficient high-yield continuous one-step dehydrogenation of butane to butadiene. This is admittedly a large order and no such process exists at this time, although development of such a process cannot be ruled out. Universal Oil Products Co., for example, anticipates "that such a process will be available in the reasonable future."

In the meantime, Table 7 indicates what may be waiting around the corner by way of new dehydrogenation processes which are now available or very close to commercial availability. Table 7 lists what little information can be obtained at this time[30 31] on these processes.

UOP Fluidized Bed

Universal Oil Products Co. states that it has available an economic process for the manufacture of butadiene from butane. Four basic steps are involved:

1. Fluid catalytic dehydrogenation of butane.

2. Extraction of C_4 unsaturates produced.

3. Fixed-bed catalytic dehydrogenation of butylene.

4. Extraction of butadiene.

The process is continuous, with raffinates from butylene and butadiene extraction units recycled to the appropriate reactors.

Fluid cat dehydro . . . An important feature of this system is the fluid catalytic dehydrogenation of butane. UOP states that the wide range of conversions possible with this unit

This Ampco centrifugal is being used as a charging pump handling treated water in a California oilfield.
you never see a repair tag on this one!
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P-39

TABLE 6–EXISTING COMMERCIAL PROCESSES

BUTANE DEHYDROGENATION

HOUDRY ONE-STEP	PHILLIPS 2-STAGE
(Fixed bed—adiabatic—chromia-alumina type catalyst) SPACE VELOCITY: 1 to 3 V/V/H TEMPERATURE: 1125°F avg. (1000-1200°F. range) PRESSURE: 3 psia. for butadiene production; atmospheric pressure for butenes production REGENERATION: Requires periodic reactivation with preheated air—generally 8-10 minutes on stream followed by purging and regeneration. **1. BUTADIENE PRODUCTION** Once-through yield: 11 wt. per cent. Ultimate total yield: 52 wt. per cent or better. **2. BUTADIENE AND BUTENE PROD.** (See Table 5—latest commercial Houdry process data) Butadiene finishing with either C.A.A. or furfural in existing plants; but any of the other suitable separation method could be employed with the Houdry process.	**1. BUTANE DEHYDROGENATION** (Multitubular isothermal reactor—chromia alumina catalyst) CONVERSION: 30 mole %/pas SELECTIVITY: 83-87 mole % (butylenes and butadiene production) TEMPERATURE: 1100° F. REGENERATION: Requires periodic reactivation with flue gas-dilute oxygen stream. **2. BUTYLENE PURIFICATION** GAS RECOVERY: Conventional absorption in 220 MW oil. BUTENES CONCENTRATION: Extractive distillation with furfural. **3. BUTYLENE DEHYDROGENATION** (Bed-type reactor-steam dilution, adiabatic—Phillips 1490 catalyst) CONVERSION: 27 mole per cent/pass. SELECTIVITY: 76 mole per cent. TEMPERATURE: 1200° F. **4. BUTADIENE PURIFICATION** Extractive distillation with furfural.

TABLE 7—FUTURE COMMERCIAL PROCESSES

UNIVERSAL OIL PRODUCTS CO.	HOUDRY PROCESS CORP.
STEP 1—BUTANE DEHYDROGENATION: Continuous fluid cat reactor. Wide range of conversions possible.	STEP 1—BUTANE DEHYDROGENATION: Continuous moving-bed cat reactor.
STEP 2.—BUTYLENE DEHYDROGENATION Fixed-bed reactor (Dow catalyst).	STEP 2—BUTYLENE DEHYDROGENATION: Fixed-bed reactor—can handle high-butene feeds. Improved catalyst competitive with Dow catalyst.

permits operation at the conversion level which provides the optimum balance between feed costs and operating costs for a particular manufacturer. UOP has not given any figures on selectivity, but high over-all yields of butylenes and butadiene are obtained. Operating efficiency and catalyst stability are both high.

The UOP fluid catalytic dehydrogenation unit can also be used to produce C_4 olefins for alkylation units or for butyl-rubber manufacture.

Houdry Moving Bed

Houdry Process Corp. has developed a moving-bed process for continuous butane dehydrogenation, and can couple this with fixed-bed butylene dehydrogenation that can handle high-butene feeds.

High-butene feeds . . . Feed stocks approaching 100 per cent butene content can be handled on the Houdry Step 2. The use of an improved catalyst in this fixed-bed reactor is stressed by Houdry. This is stated to have a longer life, requiring few catalyst changes and so reducing operating costs. The catalyst is stated to be competitive in conversion and selectivity with Dow catalyst.

The possibility of using these catalysts for other dehydrogenations is not being overlooked—isobutane to isobutylene, propane to propylene, isopentene to isoprene, ethylbenzene to styrene, isopropylbenzene to alpha-methylstyrene, etc.

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Ingenuity pays off at Krotz Springs

By Larry Resen
District Editor

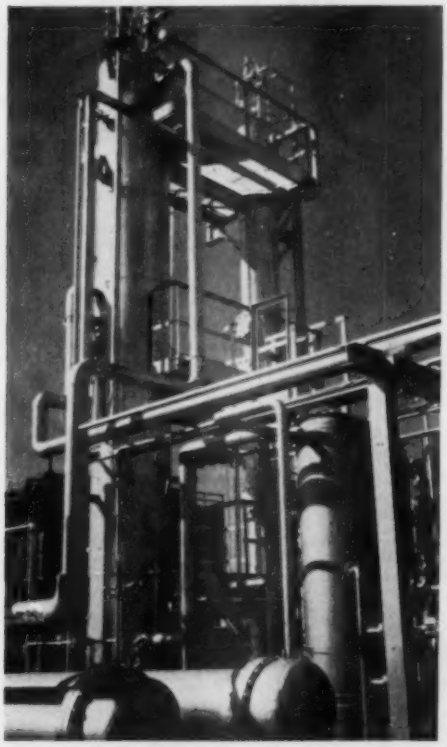
SEVERAL on-the-job improvisations have been made at Krotz Springs, La., cycling plant operated by Gulf Oil Corp.

Salt contained in incoming condensate was prevented from reaching processing equipment by means of a water-wash system. A vortex problem on the suction line of a surge tank was whipped by means of a specially designed baffle. A two-stage distillation system was built to provide for the production of a narrow-boiling-range lean oil.

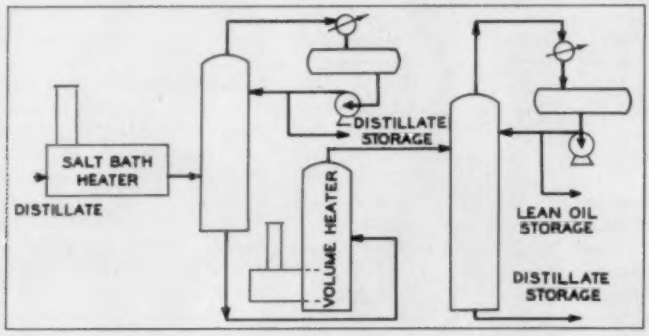
Salt problem . . . Condensate from the field wells at Krotz Springs has a high salt content, exceeding 300 g. per barrel at times. When the condensate would be heated to 400° F. in the heat exchangers, the salt would precipitate and plug up the tubes. This necessitated bypassing the exchangers and condensate stabilizer approximately 12 hours per day while the salt was washed from the tubes.

Solution to the problem involved the installation of a reciprocating pump to inject fresh water to the condensate stream just before it entered a 210-psig. flash tank. In the process, incoming field distillate, gas, and salt water charged to the inlet scrubber. Liquids from the scrubber pass through two-stage flashing. The first stage flashes at 500 lb., and the second at 210. It is just prior to this second stage that the water is injected. The water is added with a demulsifying agent ahead of a dump valve to insure good mixing and washing. A bootleg was installed on the bottom of this tank and the water is dumped automatically as it settles to the bottom of the flash tank. The washed condensate then flows on to heat exchangers. About 22 g.p.m. of water is injected into the system to wash the 5,000 bbl. per day of condensate processed. This has proved a satisfactory means of removing the salt from the condensate and has eliminated the plugging problem.

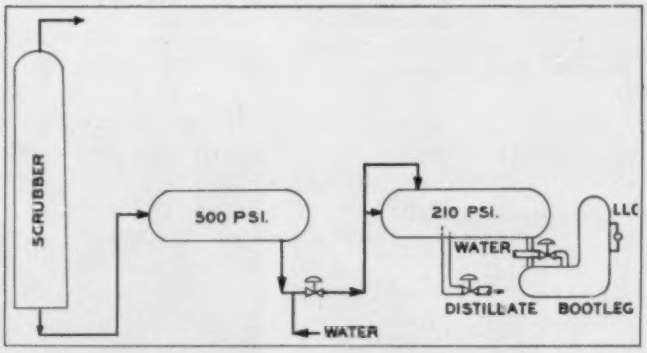
Surge tank . . . In the process, lean oil is picked up by three centrifugal pumps taking suction from the lean-oil surge tank. These pumps are manifolded together in parallel. Previously, the upstream pump was subject to gas locking. This condition occurred even when the level in the tank was high. Inspection of the horizontal tank showed that the oil would vortex around the suction outlet at the bottom of the tank. Consequently,



A SIMPLE two-stage distillation system is used at the plant to provide lean oil.



LEAN OIL STORAGE at Krotz Springs is shown in this diagram.



SALT-WATER-REMOVAL system features reciprocating pump to inject fresh water to condensate stream.

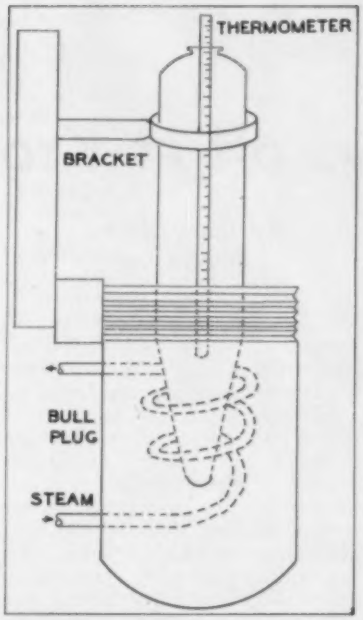
gas would be sucked into the suction line and end up by gas locking the pump.

It was decided to put a flat plate above the outlet pipe, which would work to break up any vortex action. It was desirable to install this plate with a minimum of down time. This called for a prefabrication job plus the use of brass to eliminate any sparks which might occur during installation. A 24-in.-diameter plate was cut out and four legs were brazed to this plate to act as stabilizers on the bottom of the tank. Two straps were also brazed to the plate, and these supported a clamp which was sized to fit around the 10-in. outlet riser in the bottom of the tank. Two dog ears on the clamps were used to make it tight. The legs, meanwhile, were sized to provide a 10-in. clearance between the plate and the stub end of the outlet riser.

This assembly was quickly installed within the lean-oil surge tank with only 1 hour down time required. It has proved successful in eliminating gas locking of the lean-oil pump.

Lean oil . . . A simple two-stage distillation system is used at the plant to provide makeup lean oil. The distillation unit provides a narrow-boiling-range product which has a 380°-400° i.b.p. and a 560°-585° e.p., with a 188-190 molecular weight. This high-quality product remains longer in the process, thereby reducing the over-all makeup requirements of the plant.

Field distillate is first charged to an oil-field-type salt-bath heater where it is preheated prior to entering the first-stage tower. From here distillate is removed overhead to storage and bottoms are reheated in a volume-type heater. Overhead from this heater is charged to the second-stage tower. Here lean oil is removed overhead to storage and bottoms are charged to distillate storage. The facilities have a capacity of 15 g.p.m. and are operated intermittently to satisfy plant requirements.



SIMPLE STEAM POTS permit boilaway tests in cold weather.

A typical sample of lean oil produced this way has an API gravity of 41.7° and tests out on the ASTM Engler distillation test as follows:

(Degrees Fahrenheit)

I.b.p.	388	50%	460
5 per cent	409	90%	526
10 per cent	410	e.p.	575

Boilaway tests . . . In cold weather it is often difficult to conduct boilaway tests on light products due to low ambient temperatures. Simple steam pots have been constructed from 2-in. bull plugs to provide a ready heating medium for the boilaway test tubes.

The plugs have been equipped with small coils through which steam can be introduced. The steam pots are mounted in a process-area control shelter and are equipped with clamps for supporting the test tube and thermometer. When a test is to be made, the tube with sample and thermometer is clamped into position, a small amount of steam is entered into the coils, and the resulting temperature rise permits the boilaway tests to be made quickly and accurately.

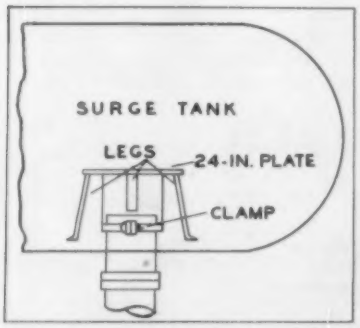
Vapor pressure tests . . . Another handy process area installation is a tank for making Reid vapor pressure tests. The tank is simply constructed from a short section of pipe and is equipped with a squared top piece to provide a working area. The tank internals include a bracket for supporting the test bomb and clamp for a water thermometer. Steam is cracked into the water in the tank and the desired test temperature is thereby achieved.

Steam traps . . . A considerable number of instruments and motor valves are steam traced throughout the plant as part of its winterizing program. An objection to steam tracing in some instances has been the ejection of steam condensate from the lines with the resultant high rate of corrosion and staining in the immediate area.

Gulf decided a closed condensate system would not only eliminate the corrosion problem, but that a savings would be realized in both condensate returned to the boilers and the savings of chemicals in the condensate. A small steam trap weighing only ¾ lb. aided considerably in the installation due to its smallness which, of course, allowed quick and easy installation in tight places. Also, due to its weight, no additional support is required.

Acknowledgments

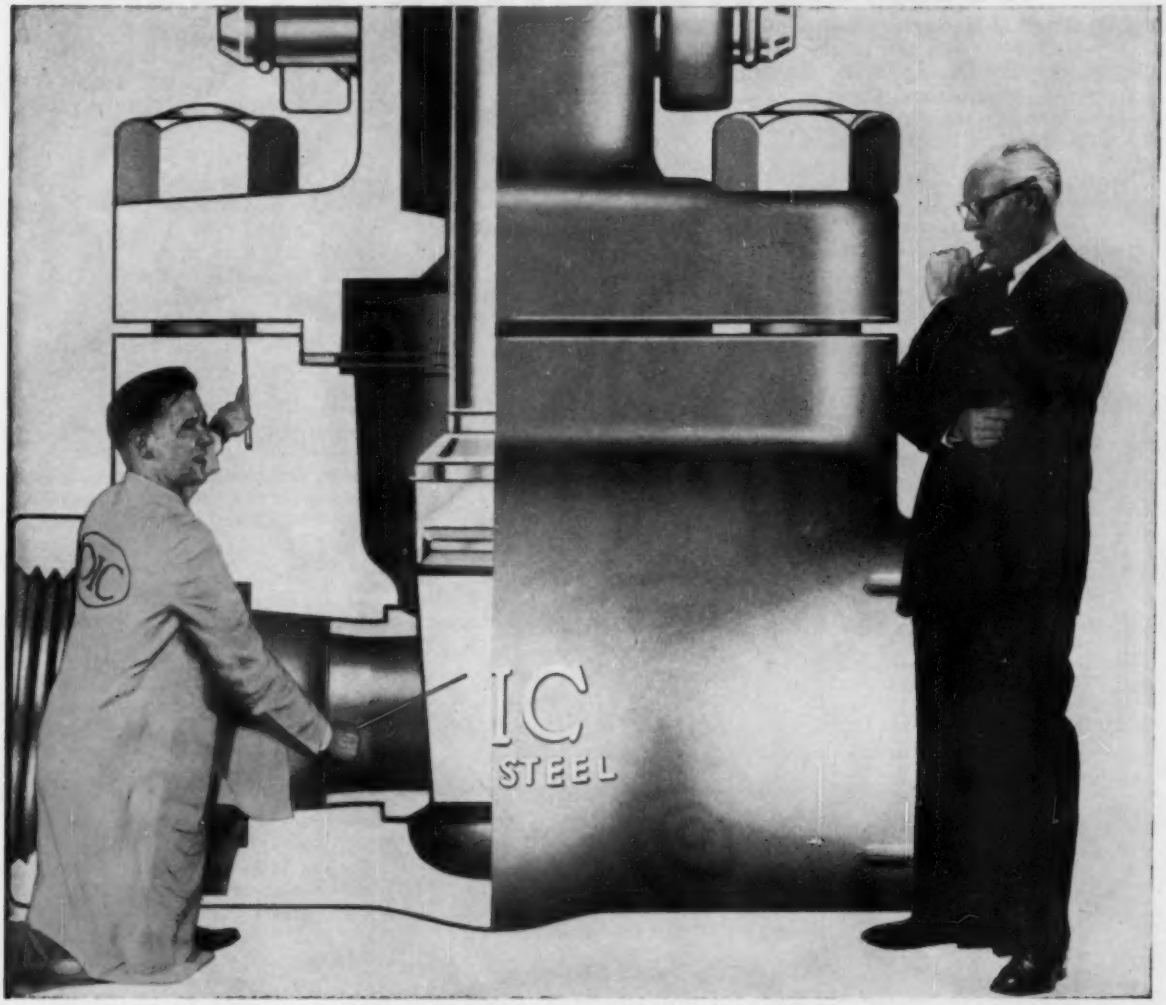
Cooperation of the management of Gulf Oil Corp. in the release of this information is gratefully acknowledged as is the assistance of Green Maynard, plant superintendent, and Joe Sablatura, plant engineer.



METAL PLATE eliminates vortex action.

A SHORT SECTION of pipe with a squared top piece is used to make R.v.p. tests.

...and you can see here....and here, sir, how we've killed maintenance problems on our new forged steel lines.



We stop galling and erosion by giving you 13% chrome stainless steel trim with wedges *duracased* to a rugged *1000 Brinell hardness.*

The square and *bolted* body-bonnet joint makes it easy to service the valve quicker. And it's a tighter joint, made doubly leakproof by recessing the soft iron gasket into the body. The gasket can't blow!

And you get the fastest joint make-up you've ever seen. Look at those pipe ends. See the extra wrench-gripping area and lugs. See how body-bonnet flanges are out of the wrench's way. No time lost here!

These new 600-lb. OIC forged steel valves are available with either *high-flow* ports (1300 line), or *standard-flow* ports (1100 line). Call your OIC Distributor, or write for specification literature.

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OIC VALVES | BRONZE, IRON, FORGED AND CAST STEEL, LUBRICATED PLUG VALVES

How to calculate
Multiphase Flow Systems

By Dr. John M. Campbell
Chairman, School of Petroleum Engineering,
University of Oklahoma

ONE of the primary limitations of available multiphase flow correlations is the fact that only relatively low-pressure systems, with relatively small pipe, have been investigated. Consequently, extrapolation of data to other systems is extremely hazardous. Even though a given correlation gives good results on data shown, there is no reliable way of extending it. This points out the need for more basic work to probe the relationships between variables, and less emphasis on over-all empirical correlations.

The most widely used methods of correlation are the Martinelli method and use of modified friction factors. The former is based on earlier work performed by Martinelli et al.[1] on lines from 0.0586 in. to 1.017 in. diameter, lengths from 2.34 to 50 ft., and pressures from 18 to 52 psia.

Their method is to calculate both liquid and gas pressure drops, assuming that only one phase is flowing in the line. The ratio of these pressure drops $\Delta P_L/\Delta P_G$ is called X. The two-

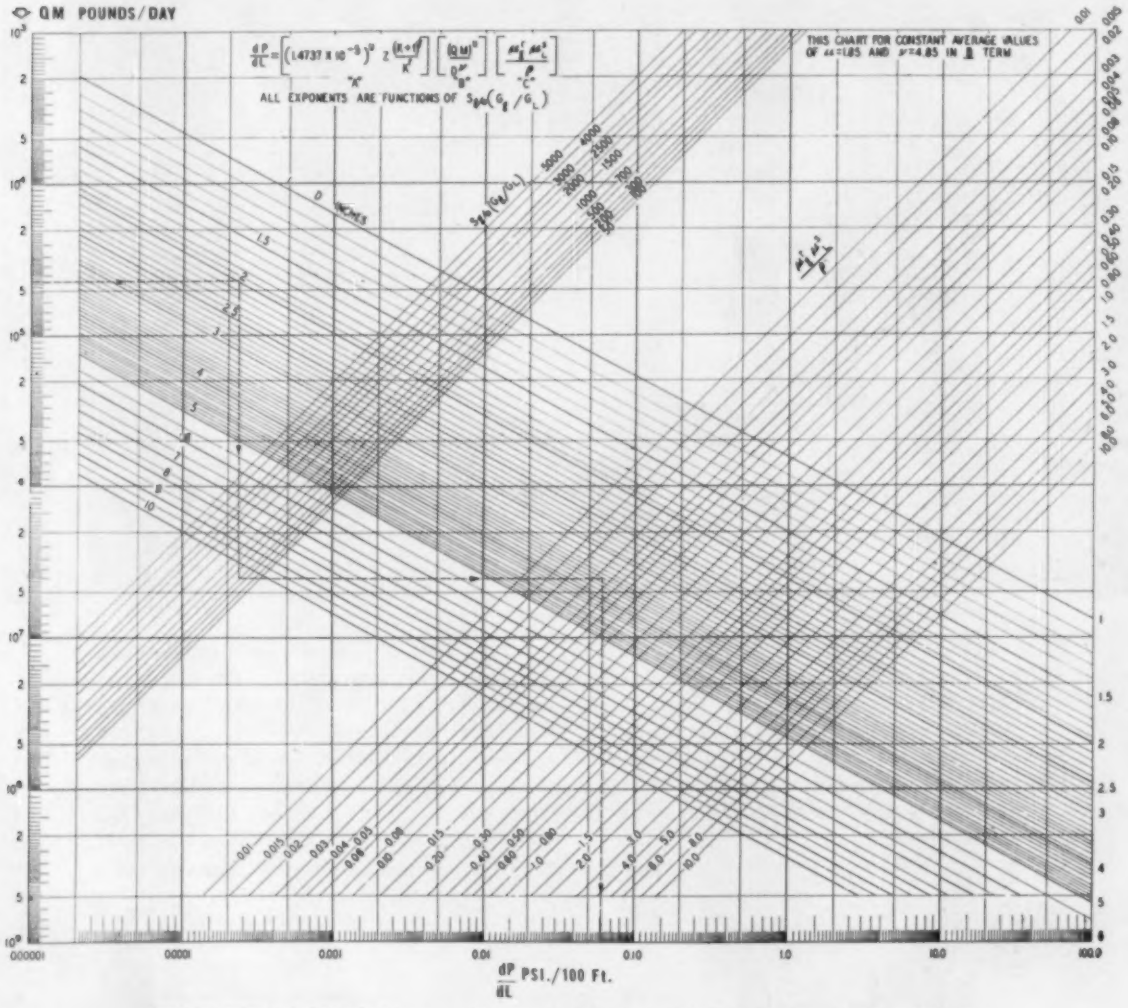
QM POUNDS/DAY
THIS CHART FOR CONSTANT AVERAGE VALUES OF μL=1.05 AND μG=0.85 IN Y TERM
ALL EXPONENTS ARE FUNCTIONS OF Sin(GG/GL)
dP/dL PSI./100 Ft.

CHART FOR ESTIMATING pressure drop for horizontal multiphase fluid flow in pipes. Fig. 1.

phase pressure drop (ΔP_{Tp}) is then given by the equations

$$\Delta P_{Tp} = \Delta P_G \Phi_G^2$$

and

$$\Delta P_{Tp} = \Delta P_L \Phi_L^2 \qquad (1)$$

Correlations are shown for the multipliers Φ_G and Φ_L in terms of X. No variation in the pattern of flow was formally considered, although the basic assumptions indicate that the correlation would be primarily limited to annular flow.

Later investigators have shown that the above correlation predicts pressure drops higher than those actually obtained on larger sized lines and at higher pressures. Baker[2] reports work on 8 and 10-in. lines, at approximately 1,000 psig., which showed pressure losses 40 to 60 per cent below those predicted.

Chenoweth and Martin[3] reported that both line size and pressure affected the original correlation. The correlation was most satisfactory at atmospheric pressure, but became gradually worse as the line size was increased from 1½ to 3 in. The correlation predicted results that became progressively higher as the pressure increased to 100 psig. At 100 psig. with 3-in. pipe, the original correlation predicted pressure drops that were 2.5 times those measured. They therefore have proposed a modified correlation to account for these factors.

A recent report by Bertuzzi et al.[4] proposes a correlation using an overall friction factor based on the Reynolds numbers of the liquid and gas phases. These are, in turn, based on the pipe diameter and the gas-liquid mass ratio. For the limiting conditions of all gas and all liquid, the correlation reduces to that for single-phase flow, if pipe roughness is neglected.

This correlation has been proposed for diameters to 2 in., pressures to 55 psia., a gas-liquid ratio less than 5,000 std. cu. ft. per barrel, and normal hydrocarbon characteristics. From previous data it would therefore be logical to expect that lower pressure drops than those predicted would be obtained with higher pressures and larger diameters.

Fig. 1 shows a convenient nomographic solution that might be used in estimating pressure loss. The nomenclature used is as follows:

Q = liquid, bbl. per day
M = total mass of liquid and gas associated with 1 bbl., lb. $= (5.61)(62.4)(G_L) + (0.0764)(G_g)(S_g/o)$
G_L = liquid sp. gr. (water = 1.0)
G_g = gas sp. gr. (air = 1.0)
S_g/o = gas-liquid ratio, s.c.f./stock-tank bbl.
D = inside pipe diameter, in.
μ_g = gas viscosity, lb./ft.-sec.
μ_L = liquid viscosity, lb./ft.-sec.
ρ = density at pressure P and average temperature, lb./cu. ft. $= M/V_m$
β = formation volume factor of oil
S_s = solubility of gas in liquid, s.c.f./bbl.

$$V_m = 5.61\beta + \frac{P_s T_{avg} Z}{P T_s}(S_g/o - S_s)$$

P = average line pressure

Because any of the present methods have obvious limitations, it behooves the designer to proceed cautiously and probably crosscheck the results given by several methods. The following approach has been found generally satisfactory for line sizing, for a specific case where liquid and gas volumes, their properties, and allowable pressure drop have been specified:

1. Determine line size for gas and liquid, assuming each is flowing separately.
2. Add the two diameters obtained in (1) above to arrive at the first estimate of the proper two-phase line.
3. Using the diameter estimated above, calculate the probable pressure drop, using several of the correlations that appear to best fit your system.
4. If the range of pressure drops obtained falls within that specified, the diameter estimated is satisfactory. If not, a new size must be assumed.

Inasmuch as the correlations generally give high pressure losses, the minimum pressure loss from the several calculations may usually be used. It is, however, a judgment decision. In any event, don't go overboard on safety factors because of uncertainty, for oversizing may result in increased pressure losses due to altered flow patterns.

If the pressure drop exceeds 10 per cent of the flowing pressure, it is preferable to calculate the lines in sections to reduce error.

One may never consciously ignore the flow pattern in designing a system, but it can never be more than a secondary factor. You may design with a certain type of flow in mind, but you are never certain that it will be realized in practice. On the basis of experience and experimental knowledge gradually emerging, the writer feels that two-phase flow patterns may be ultimately divided into only two regions—one where the gas and liquid flow in two unbroken phases, and one where slugs of gas are divided by intervening walls or partitions of liquid. It appears doubtful that small variations of these two basic types will be measurable in commercial pipeline systems.

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New alkylation unit of Socony Mobil Oil Co., Inc., at Buffalo. Control house is at left, and depropanizer, reactor effluent, and olefin towers are in rear. The unit was designed and is being constructed by M. W. Kellogg Co.

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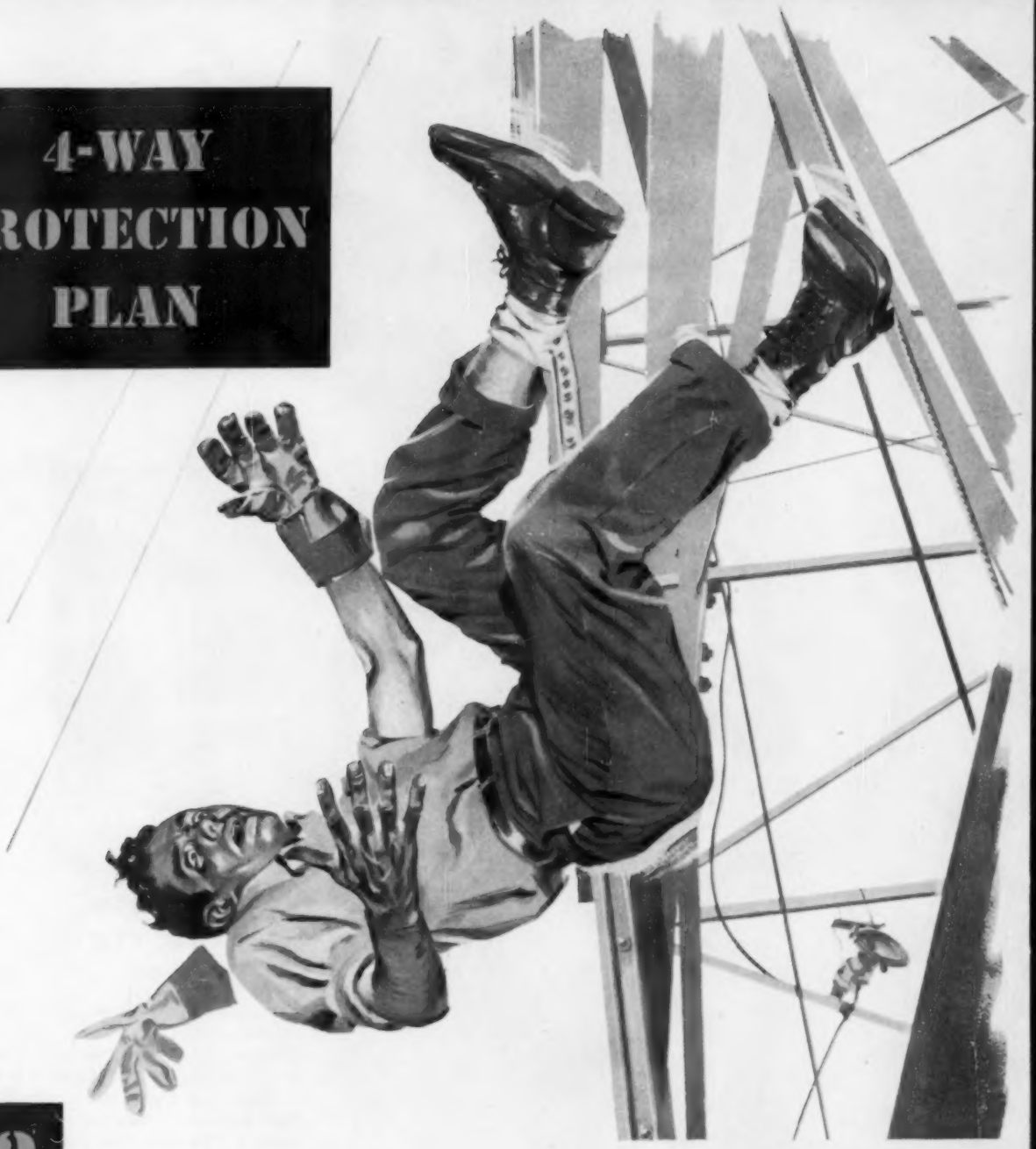
4-WAY PROTECTION PLAN



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Continued on next page . . .

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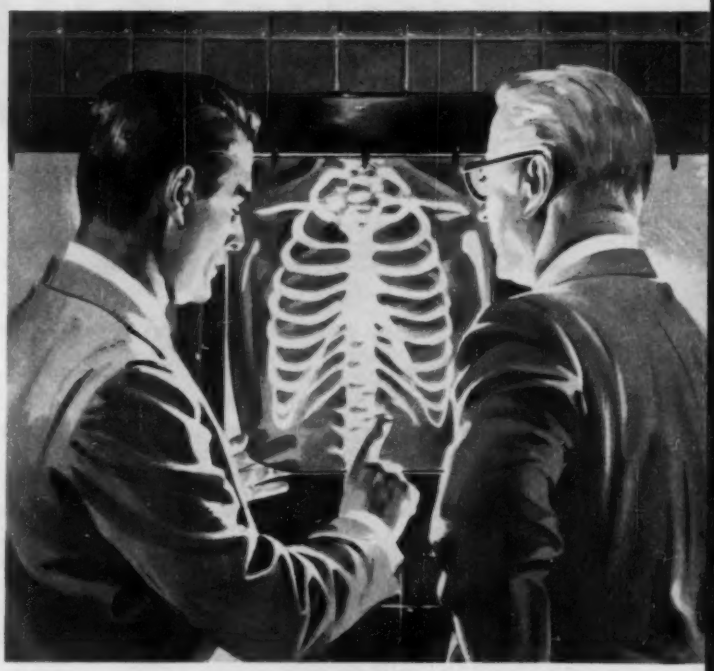

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Continued on next page . . .

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How to Solve Those Linear Programing Problems

By Robert L. McIntire
The Datics Corp.

IN THE immediately previous article in this series, we showed the results of using electronic computers to solve gasoline-blending problems. The mathematical tool was linear programing. In order to place faith in these results, refinery engineers need to understand the logic (and some mechanics) of linear programing. G. H. Symonds explains this procedure simply in his example of fuel-oil blending.

Pitch, P, is blended with flux stock, F, to make a fuel oil which meets minimum specifications on both viscosity and gravity. A part of the available 1,000 gal. per hour of pitch is used as feed stock, V, to a visbreaking unit which produces 80 per cent tar. This tar, T, is then blended to make the fuel oil.

Set 1 is an expression of all of these conditions in algebraic form. The two inequalities use the blending coefficients of P, T, and F and require that the fuel-oil viscosity be at least 21 and the gravity be at least 12°. The two equations are material-balance relationships.

Set 2 evolves from Set 1 if we eliminate T as a dependent variable in the over-all process and insist on meeting the viscosity and gravity specifications exactly. However, this method of attack leads to

$$P = -333, \qquad F = 333,$$

$$V = 1333, \qquad T = 1067,$$

as a solution. Since negative quantities are not permissible, the solution is impossible. The Simplex method of linear programing introduces two new factors into the problem: (1) a set of "slack" vectors and (2) the profit equation to be maximized.

Set 3 is obtained from Set 2 by letting X_1, X_2, and X_3 allow for possible "giveaway" in viscosity, gravity, and quantity. The profit function, Z, states that the net profit is increased by 5 cents per gallon of pitch used (by 4 cents per gallon of visbreaker feed used) and is decreased by 3 cents per gallon of flux stock used. The first three equations are to be solved simultaneously for values of the six variables such that Z is a maximum. All the coefficients may be rewritten as the array in Set 4.

Set 4 is in form for the Simplex technique of solution. If the unknowns P, V, and F are considered zero, the remaining three unknowns (X_1, X_2, and X_3) are equal to 0, 0, and 1000 respectively. The profit is zero and no fuel oil is produced. Since the element in the P column is the largest negative number in the profit function, the greatest increase in profit can be made by introducing pitch into the blend. Algebraically, we want to operate on the entire array in such a manner that the P column will contain the elements 1,0,0,0. This column is then said to be "included in the basis."

The first element is converted to 1 by dividing the entire first row by this element. Rows X_2 and X_3 are computed by subtracting corresponding elements of the new P row from elements of the old rows X_2 and X_3. The new profit equation is obtained by multiplying the new P row by 5 and subtracting the product from the old Z row.

Setting V, F, and X equal to zero and solving still gives up no fuel oil and zero profit since pitch alone will not meet the requirements. The large negative profit associated with the F column at this stage shows the advisability of introducing flux.

Set 6 is obtained by introducing flux into the basis and Set 7 is obtained by introducing the visbreaker feed, V. Since the profit function in 7 has no negative elements, 7 is our desired optimum. This case requires that all the pitch be processed through the visbreaker and that the 800 gal. per hour of tar produced be blended with 500 gal. per hour of flux. The viscosity of the blend is exactly 21 but the gravity will be greater than minimum. The maximum profit is 1000 (.04) — 500 (.03) = $25.00 per hour.

This example was small and simply solved. However, the quantity of arithmetic involved in large, practical problems is prodigious. Every major and most independent oil companies now use electronic computers to solve this problem.

SET 1—THE INITIAL CONDITIONS

$$\begin{aligned} 5P + 11T + 37F &= 21\,(P+T+F) \\ 8P + 7T + 24F &= 12\,(P+T+F) \\ P + V &= 1000 \\ T &= 8.V \end{aligned}$$

SET 2—SOLUTION BY SIMULTANEOUS EQUATIONS

$$\begin{aligned} -2P - V + 2F &= 0 \\ -P - V + 3F &= 0 \\ P + V &= 1000 \end{aligned}$$

SET 3—INTRODUCING SLACK AND PROFIT

$$\begin{aligned} 2P + V - 2F + X_1 &= 0 \\ P + V - 3F + X_2 &= 0 \\ P + V + X_3 &= 1000 \\ -5P - 4V + 3F &= 0 = \text{profit} \end{aligned}$$

SET 4—THE SIMPLEX TABLEAU

	P	V	F	X_1	X_2	X_3	Q
X_1 :	2	1	−2	1	0	0	0
X_2 :	1	1	−3	0	1	0	0
X_3 :	1	1	0	0	0	1	1000
Z :	−5	−4	3	0	0	0	0

SET 5—PITCH IN THE BASIS

	P	V	F	X_1	X_2	X_3	Q
P :	1	1/2	−1	1/2	0	0	0
X_2 :	0	1/2	−2	−1/2	1	0	0
X_3 :	0	1/2	1	−1/2	0	1	1000
Z :	0	−3/2	−2	5/2	0	0	0

SET 6—PITCH AND FLUX IN THE BASIS

	P	V	F	X_1	X_2	X_3	Q
P :	1	1	0	0	0	1	1000
X_2 :	0	3/2	0	−3/2	1	2	2000
F :	0	1/2	1	−1/2	0	1	1000
Z :	0	−1/2	0	3/2	0	2	2000

SET 7—VISBREAKER FEED AND FLUX IN THE BASIS

	P	V	F	X_1	X_2	X_3	Q
V :	1	1	0	0	0	1	1000
X_2 :	−3/2	0	0	−3/2	1	1/2	500
F :	−1/2	0	1	−1/2	0	1/2	500
Z :	1/2	0	0	3/2	0	5/2	2500

Reference

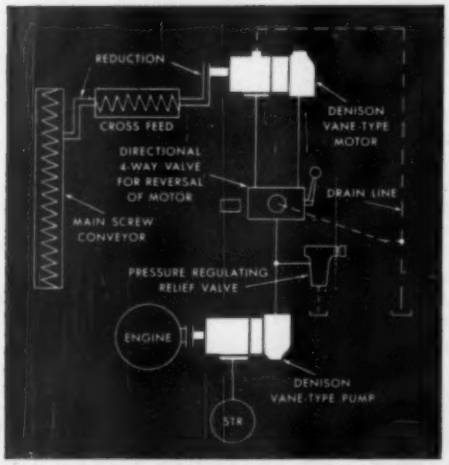
1. G. H. Symonds, "Application of Linear Programing to the Solution of Refinery Problems," No. 1, January 15, 1954.

"Baroid Express" speeds mud handling

SPEEDY MUD HANDLING BEGINS when bags of Baroid are loaded into a "bazooka" mobile screw conveyor for fast loading to bulk delivery truck.

Photos courtesy Universal Baroid Corporation, Division of National Lead Company

DENISON hydraulic power keeps it on schedule



CIRCUIT DIAGRAM illustrates Denison 2000 psi hydraulic system for powering Louisiana Baroid's "bazooka" mobile screw conveyor.

Baroid . . . from bag to truck to drill site. Denison hydraulic power helps speed its delivery for fast, efficient mud handling.

To speed delivery of Baroid from bag to truck—Louisiana Baroid Sales Division counts on its hydraulic powered "bazooka" as a mobile conveyor. With this power feeder, bags of Baroid are simply emptied at waist height into an open hopper which cross-feeds to the main screw conveyor.

The heart of Louisiana Baroid's "bazooka" is a Denison 2000 psi hydraulic system consisting of a vane-type pump and interchangeable vane-type motor.

The vane pump—driven from a four-cylinder, 20-horsepower engine—supplies hydraulic power to the motor, which rotates the hopper screw and the main screw conveyor. The result is a simple but efficient variable-speed drive easily set to suit the needs of the operator.

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HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

By W. L. Nelson
Technical Editor

How Complexity Boosts Refinery Costs

How can we use the Nelson Index to estimate the cost of refineries at other years than 1946 (your basis) when it is obvious that refineries consist of different equipment as the years go by? Note especially the days of shell-still batteries and agitator treating. W.G.P.

You are theoretically quite correct in noting that different equipment cannot be compared at different years by the use of a cost index. Most cost indexes can be used only to compare the cost of a specific equipment at various years, and the same applies generally to the Nelson Refinery Construction Cost Index and to the various indexes published on the Quarterly Itemized Cost Index page of the Cost-imating Series (January, April, July, and October, in The Oil and Gas Journal). However, studies undertaken herein indicate that the effect of changes in the design of refineries is not of great significance.

Between 1935 and 1946, the type of equipment used in refineries remained much the same. Although solvent extraction and dewaxing equipment was installed, its cost was not greatly different from the cost of wax presses and centrifuge dewaxing equipment. Before 1930, the

TABLE 1—COST OF FUEL-TYPE REFINERIES

Built during	1946 costs, $/bbl. Computed	1946 costs, $/bbl. Esso‡	Index (1946 = 100) Found	Index (1946 = 100) Nelson	Index (1946 = 100) Esso¶
1910	....	¶465	25.8	....	38.2
1915	....	¶580	31.3	....	36.8
1920	§373	....	58.5	....	§70.8
1927	....	¶368	35.1	....	65.0
1930	†430	....	67.1	70.3	....
1935	....	¶570	47.3	....	57.0
1946	452	‡684	100	100	100
1950	†462	*¶740	149 & 143	146.3	132.5
1956	†517	....	224	195.6	....
Average	$447	$580			

*With combination catalytic cracking unit, only $483 per bbl. †Converted by Nelson Index. ‡McLean and Haigh, The Growth of Integrated Oil Companies, Harvard Business School. 1954. §Converted by Engineering News Record Construction Index. ¶Construction cost index indicated by Esso.

TABLE 2—REFINERY PROCESSING SINCE 1920

	Barrels per 100 bbl. of crude oil capacity									
	1920		1930		1946		1950		1956	
	Avg.	L.O.	Avg.	L.O.	Avg.	L.O.	Avg.	L.O.	Avg.	L.O.
Avg. refinery capacity, bbl. per day	4,100	....	10,000	....	14,000	....	19,500	....	28,000	....
Distillation:										
Batch shell stills*	40	40	....	....	....	....	....	....	....	....
Continuous shell stills	80	80	80	75	....	....	....	....	....	....
Pipestill topping	....	....	20	25	100	100	100	100	100	100
Desalting or a settling still	80	80	100	100	100	100	100	100	100	100
Vacuum distillation	....	....	0.5	....	9.2	5.9	11.3	7.6	23.7	19.4
Thermal:										
Cracking	13.1	18.8	37.0	40.7	32.9	33.9	25.5	26.2	18.5	18.9
Reforming	....	....	2.0	2.1	5.6	5.8	4.5	4.6	3.5	3.6
Coking	....	....	3.0	3.1	1.8	1.9	2.4	2.5	3.4	3.5
Visbreaking	....	....	....	....	2.0	3.7	2.4	4.1	4.0	5.3
Catalytic:										
Cracking	....	....	....	....	19.1	19.5	26.5	28.2	39.0	39.8
Reforming	....	....	....	....	....	....	1.0	1.0	11.1	11.3
Asphalt manufacture	4.7	5.0	3.8	4.0	5.2	5.3	5.6	5.8	6.0	6.1
Polymerization	....	....	....	....	1.4	1.5	1.0	1.1	1.4	1.4
Alkylation	....	....	....	....	1.2	1.2	1.2	1.3	2.8	2.9
Hydrodesulfurization	....	....	....	....	....	....	....	....	5.2	5.3
Acid treating (light oils)	20.0	21.2	15.5	16.1	....	....	....	....	....	....
Acid treating, rerunning	15.0	15.9	15.5	16.1	....	....	....	....	....	....
Sweetening gasoline and TEL plant	26.8	28.4	46.6	48.5	43.2	47.0	47.6	53.5	48.8	51.6
Other light oil treating	32.7	34.6	25.3	26.3	6.2	6.7	5.8	6.0	4.4	4.6
Storage tanks, bbl.	90	80	80	75	80	70	80	70	80	70
Stream required per barrel	†200	†135	†186	†130	†154	†126	†146	†124	†140	†121
Lube:										
Finished oil	5.7	....	3.7	....	2.7	....	2.6	....	2.1	....
Steam stills	8.0	....	5.0	....	(‡)	....	(‡)	....	(‡)	....
Acid treating	4.6	....	3.0	....	1.2	....	....	....	....	....
Solvent extraction	....	....	....	....	4.8	....	5.2	....	4.2	....
Dewax:										
Presses	1.9	....	1.0	....	0.3	....	....	....	....	....
Centrifuge	§3.2	....	2.5	....	0.4	....	....	....	....	....
Solvent	....	....	....	....	1.5	....	2.2	....	1.8	....
Rerunning	5.3	....	3.7	....	5.4	....	5.0	....	4.0	....
Decolorizing	5.7	....	3.7	....	2.7	....	2.6	....	2.1	....

*Mainly rerunning operations. †Pounds steam generated per barrel. ‡Vacuum distillation included above. §Cold settling.

Questions on Technology (Continued)

TABLE 3—APPROXIMATE COSTS OF OLD TYPE PROCESS UNITS

	—Cost, $ per daily bbl.— 1946	1930	Capacity, bbl. per day
Batch shell stills:			
Crude	134	91	2,000
Steam	147	100	3,000
Coke	162	110	2,000
Continuous battery	89	61	10,000
Acid treating:			
Gasoline	19-29	.....	.....
Lubes	24-39	.....	.....
Doctor treating:			
Batch	15-35	.....	.....
Continuous	13-26	.....	.....
Pressure dist. rerun:			
Shell still	110	.....	1,000
Continuous	20-67	.....	1,000-15,000
Pressed dist. rerun:			
Shell still	160	110	500
Continuous	55-102	39-72	1,000-5,000
Solution rerun:			
Shell still	120	.....	1,500
Continuous	54-97	38-68	1,000-5,000
Dewaxing:			
Pressing and sweating	210-285	150-200	400-1,200
Cold settling	340-860	240-600	510-800
Centrifuging	850-2,150	600-1,500	600-1,000

cost of refineries was less than would be expected from a price index because of their simplicity but this effect was somewhat counteracted by the large amounts of steel used in shell stills (low crude-oil capacity) and the large amount of brick and concrete used in furnace settings.

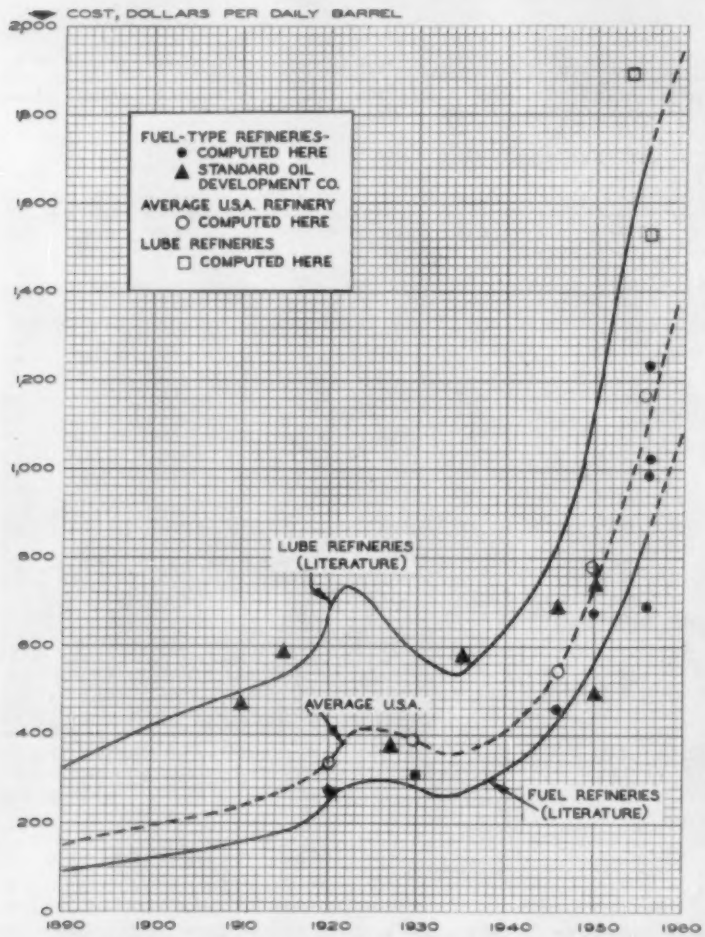


Fig. 1—Approximate cost of refineries in the United States.

Since 1946, the cost of refineries has risen slightly more than would be expected by a price index because of the somewhat greater cost of catalytic cracking plants, but mainly because of numerous rerunning or reprocessing operations such as reforming, desulfurization, and solvent extraction. Meanwhile lubricating-oil equipment became relatively cheaper (not counting inflation). Thus, without inflation, the costs of fuel-type refineries (all based on 1946 prices) have been about as shown in Table 1.

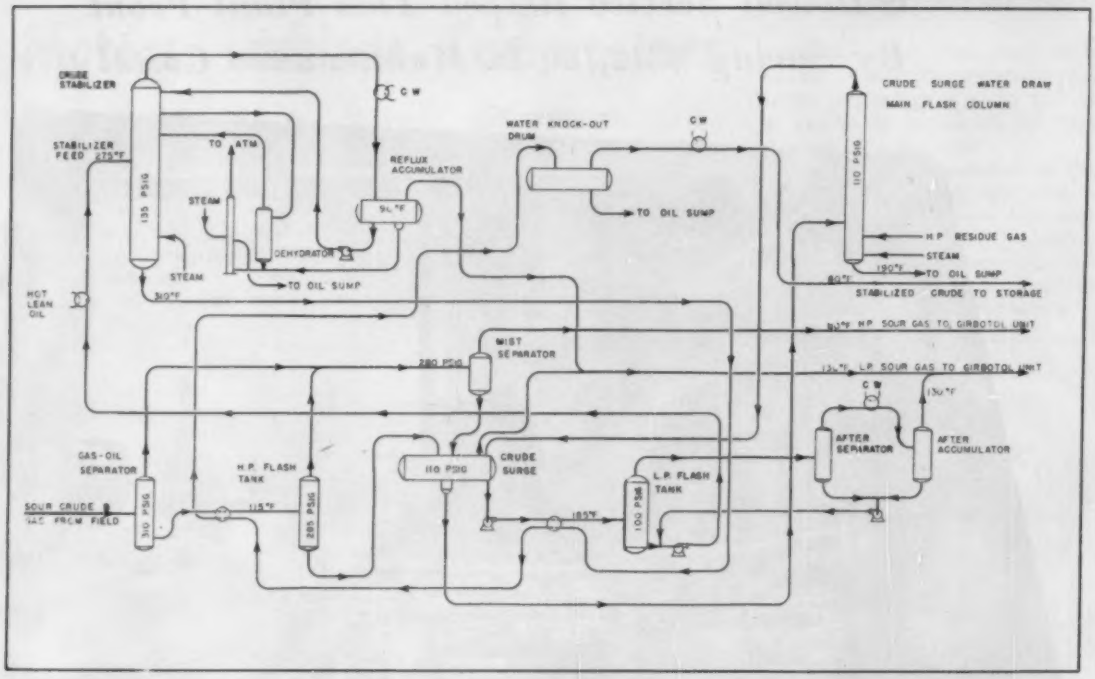
Plant costs were actually computed for five different periods using the processing indicated in Table 2. Costs for each type of processing unit are available in the Cost-imating Series except very old operations such as those shown in Table 3.

The costs found in this study as well as those indicated by the literature are indicated in Fig. 1. The effect of changes in design is probably not a very important factor. Note that the cost of plants has now increased about 105 per cent (factor of 205) since 1946 whereas the cost of construction before 1946 is not clear but this may be due to what appears to be a very high Esso cost for its 1946 refinery. However, if the curves of Fig. 1 are used to determine an index of the cost of refineries, the following results shown in Table 4 are obtained.

TABLE 4

	Cost of refineries relative to 1946*	Nelson or ENR Indexes
1910	36-59	†25 est.
1920	57-81	70.8
1930	67-73	70.3
1935	62-67	62.7
1940	74-77	77.6
1946	100	100
1950	132-137	146
1956	202-208	196

At least two factors are at work. Increasing complexity tends to raise the refinery cost above that predicted by a cost index whereas increase in size tends to decrease the refinery cost. Thus, since 1946, the cost of refineries has risen somewhat more than the Nelson Construction Cost Index indicates. Before 1946, the small size of refineries tended to increase their cost above those predicted by construction cost indexes and although the refineries were simple they employed relatively large amounts of steel and refractories which tended to increase their cost.



SIMPLIFIED FLOW DIAGRAM of Pure Oil Co. Worland gasoline plant No. 2 crude-stabilization unit. Fig. 1.

Removing Sulfur From Oil

By R. S. Birmingham

AFTER the separator sour-gas effluent plus the gas derived from heating and flashing is delivered to the sulfur-recovery plant, the acid gas is removed.

Oil flows to a surge tank operated at 110 psig., thus considerable gas is liberated due to pressure reduction. This gas makes up a portion of a low-pressure sour-gas stream which is also delivered to Texas Gulf Sulphur for acid gas removal. Water is removed from oil at this point by means of surge tank sump and level control arrangement. Oil is pumped from surge tank through heat exchangers and again flashed. Gas flashed out makes up portion of sour low-pressure stream.

Fractionator . . . The oil is again heated and fed to a 30-tray fractionator. Here the oil is stripped with steam and refluxed. The overhead gas which is not condensed as reflux is the last source of low-pressure sour gas. Hot stabilized oil from the bottom of the stabilizer is used as a heating medium for sour oil flashing. Water is removed from oil, then cooled and pressured to crude storage facilities which are located some distance from the plant.

The oil is free of b.s. and w., and contains less than 0.0025 per cent by weight of hydrogen sulfide and needs no further treating before sale. Liquid hydrocarbons and sulfur which would otherwise be lost to the atmosphere are saved. Unsafe field conditions due to the toxic vapors evolved from sour unstabilized oil storage is minimized.

The flow sheet, Fig. 1, shows the process in more detail.

Author is with Pure Oil Co., Worland, Wyo. Paper presented at Rocky Mountain regional meeting, Natural Gasoline Association of America, 1957.

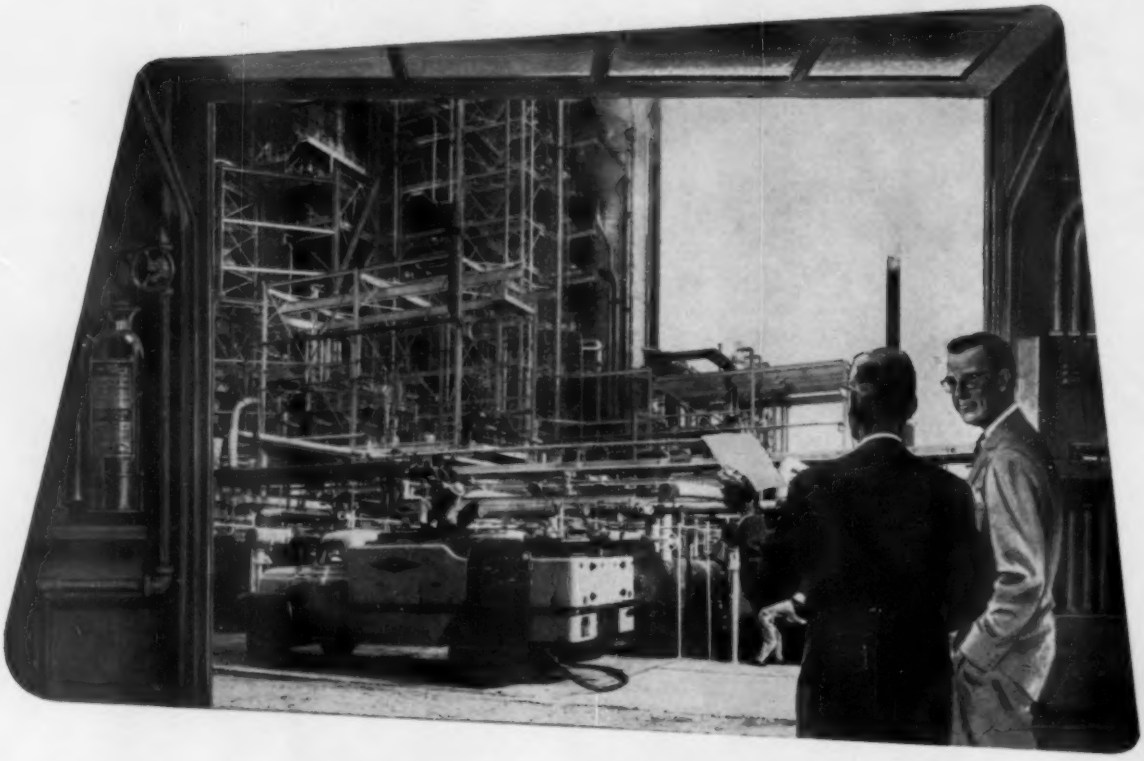
Hydrocarbon Absorption

Hydrocarbon absorption and stripper operations in the natural gasoline and L.P.G. recovery plants handling sour gas, mentioned here, are conventional. However operations are described briefly.

Absorption . . . After the natural gas has been sweetened by treatment with amine solution, it enters the oil absorber or hydrocarbon-extraction units. Here lean absorption oil is pumped over the top of bubble-tray towers. Oil absorbs gasoline, butane, and propane from the gas stream which enters at bottom. Absorption efficiency is determined by temperature, pressure, richness of gas, and rate of oil circulation. Rich oil, or oil saturated with absorbed hydrocarbons, passes from the bottom of the absorber or absorbers to the middle of the demethanizer reabsorber tower.

Demethanizer . . . This is operated at a pressure lower than the absorber, therefore there is considerable flashing of the previously absorbed hydrocarbon including some propane. This flashing is further controlled by use of a reboiler in the rich-oil stream which is heated by hot oil from bottom of the still in a tube-and-shell exhanger.

Dowell Service Helped This Plant Profit By Saving $312,700 in Maintenance Costs!



To clean and service the giant catalytic crackers in today's modern refineries is quite a job . . . and very costly. Costly, that is, unless Dowell Service is on the job to help clean the "cats"—chemically. Here's an example of how Dowell chemical cleaning service cut turnaround costs for one refiner by $312,700.

Dowell was called in to provide cat cracker turnaround service which included the cleaning of: two flue gas coolers, two catalyst coolers, four overhead aftercoolers, one light gas oil cooler, one heavy gas oil cooler, two top tray reflux coolers, and two final gas condensers.

Dowell's time: thirteen and one-half hours; Cost: $2300.

It is estimated that this same cat cracker service, if done by mechanical methods, would have cost the refinery: 1) Additional downtime of seven days—$210,000; 2) Additional spare bundle inventory—$100,000; 3) Labor—$5,000.

The refinery enjoyed a $312,700 operating credit from this single cat cracker turnaround—not including expected efficiency increases.

Dowell provides expert service in removing scale and sludge from product, process and steam generating systems. Dowell does the job for you—furnishing all chemical solvents, trained personnel, pumping and control equipment. Furthermore, Dowell has the experience in chemical cleaning to provide assurance of a job well done.

While the example here deals with an oil refinery, Dowell chemical cleaning has recorded similar profit-making savings for other industries. Dowell engineers can show you performance data in almost any field — steel, chemical, power, paper, construction.

For specific information on how Dowell chemical cleaning can help your plant to greater profits, call the Dowell office nearest you. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

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Motors, Turbines, Compressors

ELECTRIC MOTORS may be either oil or grease-lubricated. Medium and large-size horizontal electric motors are usually oil-lubricated. They are fitted with sight-feed oilers and oil rings as described in the centrifugal-pump section. Vertical motors are also fitted with sight-feed oilers but oil rings cannot be used. Therefore an impeller which runs in the oil reservoir is mounted on the shaft. (See Fig. 9). The impeller splashes the oil up to the bearings being lubricated.

On all grease-lubricated motors, the present procedure in this refinery is to remove all fittings from the housing. Then, every 2 years the motor is sent to the central mechanical building where it is checked, cleaned, and the bearing repacked.

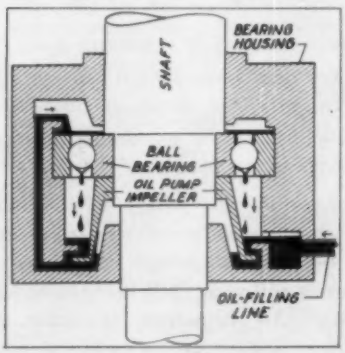
Steam Turbines

Main shaft bearings in horizontal steam turbines are almost always oil lubricated. They use the sight-feed oiler and oil-ring method of lubrication, which is the same as that used for horizontal centrifugal pumps and electric motors. Turbines have an additional bearing in the governor, however (see Fig. 10).

This bearing may be either oil or grease lubricated. If it is oil lubricated, an oil cup (see Fig. 11) or a sight-feed oiler (see Fig. 6, last week's issue) is used. If grease lubricated, a turndown cap is used.

The main shaft bearings on vertical steam turbines are usually grease lubricated. Turndown cups add grease to the housing.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.

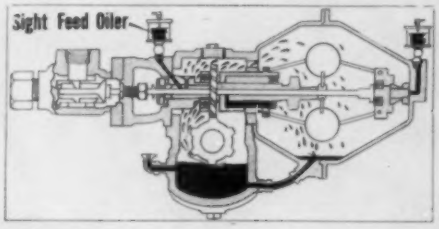


IMPELLER is mounted on shaft. Fig. 9.

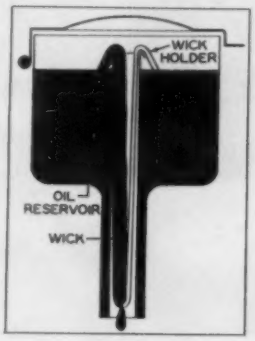
Compressors

Gas-engine-drive reciprocating compressors are designed with a large reservoir in the bottom of the case (see Fig. 12). A gage glass is attached to the side of the case to indicate the oil level. The bearings are lubricated by an oil pump which is usually mounted on the compressor shaft. This pump takes suction from the reservoir and pumps oil through a cooler and filter and on to the various bearings, governor, and gear case.

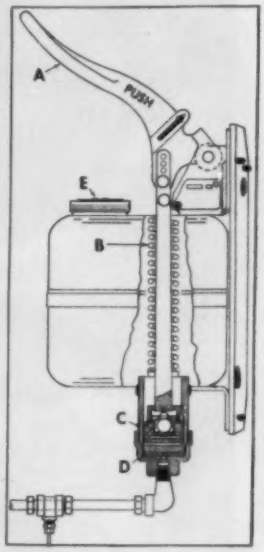
Forced-feed lubricators (see Fig. 7, last week's issue), are used to supply oil to the power and compression cylinders and piston-rod packing. A one-shot lubricator (see Fig. 13) is used on many machines to supply oil to the valve stems.



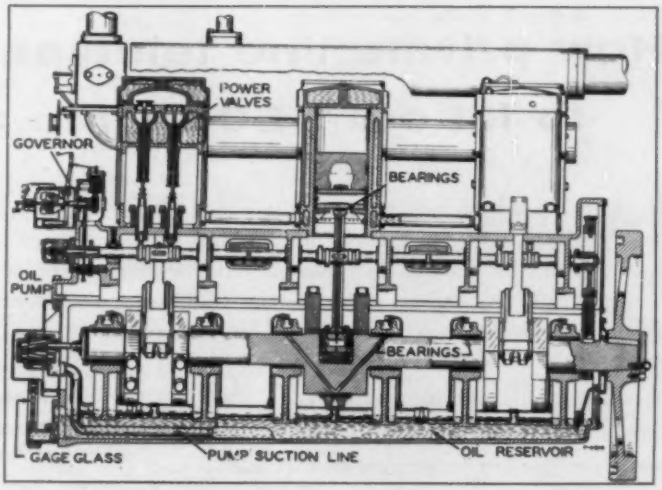
ADDITIONAL bearing in turbine governor. Fig. 10.



OIL CUP may be used on turbine governor. Fig. 11.



ONE-SHOT lubricators are used to supply oil to valve stems. Fig. 13.



SOME COMPRESSORS have large reservoir in case bottom. Fig. 12.

Ohio Oil's Kenneth Burns, Manager, Procedures Research and Machine Accounting Division, examines payroll data tape.

How private line teletypewriters send data to fill out 6500 Ohio Oil pay checks

Payroll information on The Ohio Oil Company's 6500 employees comes into Findlay, Ohio, headquarters by private line teletypewriter service from ten distant locations as far west as California: six production and two marketing points, one refinery, and the research center in Denver.

So accurate is Bell System private line transmission that every check for every employee is correct to the last thrift plan deduction.

Among other jobs, the teletypewriter network gathers basic personnel data from distant production locations. The tape is processed through business machines. Computations are made by an electronic "brain." And pay checks are issued promptly and accurately twice every month.

Here is another case where Bell System communications meet special needs. Your requirements will receive the same thorough attention. May we suggest that you call your Bell Telephone Company business office? No obligation, of course.

BELL TELEPHONE SYSTEM

Who's Laying Line—and Where

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way.

U.S. Crude-Oil Pipelines

- **Belle Fourche Pipeline Co.**
  Project: 30 miles of 6-in. from Donkey Creek pool to Fiddler Creek pool in northeastern Wyo. Will later build a line from Fiddler Creek to connect with Butte Pipe Line Co. near Osage, Wyo.
  Status: Planned.
- **Cape Pipe Line Co.** (Sun Oil Co., Cities Service Co., Atlantic Refining Co.)
  Project: Line from lower Delaware Bay to Philadelphia.
  Status: Planned.
  Completion: 1960.
- **Derby Refining Co.**
  Project: 200 miles of 12-in. from Meade County, Kans., to Wichita.
  Status: Under study.
- **Four Corners Pipe Line Co.** (Shell, Standard of Calif., Continental, Gulf, Richfield, Superior)
  Project: 635 miles of 16-in. from Aneth field in southern Utah to Los Angeles, 86 miles of 12-in. from New Mexico's Bisti field to Red Mesa station 35 miles southeast of Bluff, Utah, and 28 miles of 4, 6, 8-in. feeder lines from other fields in New Mexico and Utah. Will be operated by Shell Pipe Line.
  Status: Under way.
  Contractor: **A. P. Vaughn Construction Co.** has 170 miles of 16-in. from Aneth field to Cameron, Ariz., and 100 miles of 16-in. from Seligman to the Colorado River. **R. H. Fulton & Co** has completed 98 miles of 16-in from Cameron to Seligman, Ariz., and has 217 miles of 16-in from the Colorado River to Olive, Calif., plus river crossing. **Pacific Pipeline Construction Co.** has 46 miles of 16-in. from Olive to Los Angeles. **Standard Pipeline Construction Co.** has feeder lines.
  Completion: February 1, 1958.
- **Gillette Pipeline, Inc.** and **A. W. Hartwig, Inc.**
  Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.
  Status: Has applied for permit from Wyoming Public Service Commission.
- **Great Northern Railway Co.**
  Project: 400 to 600 miles of 12 to 20-in. from Williston basin in Montana and North Dakota, to Clearbrook or St. Paul, Minn.
  Status: Planned.
  Contractor: **Pipe Line Technologists, Inc.** has completed feasibility study.
- **Humble Oil & Refining Co.**
  Project: 90 miles of 16-in. from Hawley to Comyn, Tex.
  Status: Survey and right-of-way work under way.
  Completion: Late 1958.
- **Magnolia Pipe Line Co.**
  Project: 120 miles of 16-in. from Clyde to Iatan, Tex.
  Status: Under way.
  Contractor: **O. R. Burden Construction Corp.**
  Completion: December 31, 1957.
- **Offshore Gathering Corp.,** Houston.
  Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)
  Status: Proposed.
- **Oil Field Pipe Line, Inc.**
  Project: 20 miles 8 and 12-in. line from near Elkhart, to Ellinwood, Kans.
  Status: Proposed.
- **Shell Oil Co.**
  Project: 17 miles of 3, 4-in. in La. Delta area.
  Status: Under way.
  Contractor: **Brown & Root, Inc.,** W. P. Stanley, supt., office at Buras.
  Completion: March 31, 1958.
- **Shell Pipe Line Corp.**
  Project: 11 miles of 8-in., 3 miles of 10-in., 10 miles of 12-in., 37 miles of 16-in., and 60 miles of 20-in. from Mississippi River Delta area to New Orleans refining area.
  Status: Planned.
  Contractor: **Coates Field Service, Inc.,** has right-of-way acquisition and claims settlement.
  Completion: September 1958.
- **Sinclair Pipeline Co.**
  Project: 150 miles of 20-in. from Teague, Tex., to Houston.
  Status: To start December 1957.
  Completion: Early 1958.
- **Skelly Oil Co.**
  Project: 50 miles of 12-in. to replace partially looped 6, 8-in. line between Cunningham and Burton, Kans.
  Status: Under way.
  Contractor: **Groninger & King.**
  Completion: December 1957.
- **Southern Kansas Pipeline, Inc.**
  Project: 200 miles of 6 to 10-in. in Kans. from southwestern Meade County to 10 miles north of Arkansas City.
  Status: Proposed. Request filed with Kansas Corporation Commission for permit.
- **Texas-New Mexico Pipe Line Co.** (Sinclair, Texas Co., Tidewater, Empire)
  Project: 512 miles of 16-in. from southeast corner of Utah to Jal, N. M.
  Status: Under way.
  Contractor: **Four Way Co., Inc.,** has 150 miles from Aneth field southeast. **Panama, Inc.,** has remaining 362 miles.
  Completion: May 1958.
- **Toronto Pipeline Co.**
  Project: System to connect fields in Cheyenne, Morrill, and Banner counties, Nebr., to Platte Pipe Line Co.'s 20-in. line from Wyoming to Wood River, Ill., and 13 miles of 4-in. plus field lines to Platt's Redding station.
  Status: Planned.

U.S. Products Pipelines

- **Alaska-Yukon Refiners & Distributors, Ltd.**
  Project: Two lines: one 150 miles from Haines to Haines Junction, Alaska, linking with government Canol line; another from Tok Junction, on Canol line, to Anchorage.
  Status: Proposed.
  Completion: 1959.
- **American Pipe Line Co.**
  Project: Line from Gulf Coast to New York City. Has ODM approval to amortize 40 per cent of cost with fast writeoff.
  Status: Proposed.

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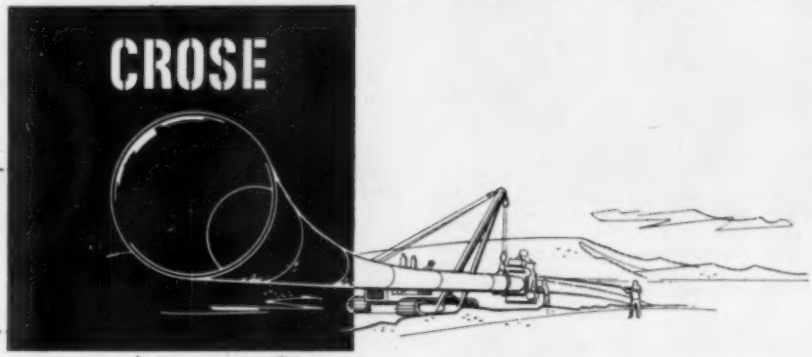
PIPELINE CONSTRUCTION

- **Buckeye Pipe Line Co.**
  Project: 70 miles of 8-in. from Wayne to vicinity of Durand, Mich.
  Status: Under way.
  Completion: Early 1958.
- **Clark Oil & Refining Co.**
  Project: 15 miles of 8-in. from Blue Island, Ill., to Hammond, Ind., area.
  Status: Planned.
  Completion: Mid-1958.
- **Columbia Gas System, Inc.**
  Project: Line from proposed plant near Kenova, W. Va., to proposed plant and storage facilities at Siloam, Ky.
  Status: Planned.
- **Conn-Mass Pipe Line, Inc.**
  Project: 62 miles of 8-in. and 7 mi'es of 6-in. from New Haven, Conn., to Springfield, Mass.
  Status: Planned to begin in 1957.
  Completion: April 1958.
  Project: 88 miles of 8-in. from Boston to Springfield, Mass.
  Status: Proposed.
  Project: 133 miles of 16-in. from Linden, N. J., to Hartford, Conn.
  Status: Proposed.
  Project: 38 miles of 6-in. from Waltham to Fitchburg, Mass.
  Status: Proposed.
- **El Paso Natural Gas Co.**
  Project: 240 miles of 6-in. from Odessa to El, Paso, Tex.
  Status: Under way.
  Contractor: **McVean & Barlow, Inc.**, E. J. Miller, supt.
  Completion: March 1, 1958.
- **Everglades Pipe Line Co.**
  Project: 60 miles of 10-in. from Port Everglades, Fla., to Miami's International Airport and terminals south.
  Status: Under way.
- **Florida Pipeline & Storage Co.**
  Project: 67 miles from Everglades, Fla., to Homestead Air Force Base south of Miami.
  Status: Under way.
  Contractor: **Fish Service Corp.**
  Completion: December 1957.
- **Georgia Pipeline Co.**
  Project: 7-mile line from Savannah, Ga., to Hunter Air Force Base
  Status: Planned.
  Completion: December 31, 1957.
- **Katy and New York Central Railroads**
  Project: 2,000 miles of 10 or 12-in. from Houston through Kansas City, St. Louis, Indianapolis and Cleveland to Syracuse then down to New York City. A branch would go through Chicago to Detroit.
  Status: Planned.
  Contractor: **Williams Brothers Co.** has feasibility study. Report due December 1957.
- **Laurel Pipe Line Co.** (Gulf Refining Co., Sinclair Pipe Line Co., The Texas Co.)
  Project: 100 miles of 24-in. and 340 miles of line graduating down to 14-in. at the west terminus, from Philadelphia to Cleveland.
  Status: To start early 1958.
  Completion: Summer 1958.
- **Leonard Refineries, Inc.**
  Project: 43 miles of 6-in. from Alma to Lansing, Mich.
  Status: Planned.
  Contractor: **Welded Construction Co.**
  Completion: Spring 1958.
- **Ohio Oil Co.**
  Project: 350 miles of 12-in. from Wood

CROSE



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PIPELINE CONSTRUCTION

River, and Robinson, Ill., to Chicago.
Status: Under way.
Contractor: **Panama-Williams Corp.** has completed 84 miles from Robinson to Champaign.
Completion: 1958.

• **Salt Lake Pipe Line Co.**
Project: 80 miles of 8-in. loops from Adams to Ontario, Ore.
Status: Under way.
Contractor: **Hallmac Construction Co.**

• **Shamrock Oil & Gas Corp.**
Project: Conversion of 120 miles of 6-in. crude line from Sunray, Tex., to Turpin, Okla.
Status: Under way.

• **Southern Pacific Pipe Lines, Inc.**
Project: 22 miles of 8-in. and 48 miles of 10-in. from Richmond to Stockton, Calif.; 57 miles of 10-in. from Stockton to Rocklin, Calif.; 33 miles of 6-in. and 43 miles of 8-in. from Rocklin to Donner Summit, Calif.; 13 miles of 8-in. and 91 miles of 6-in. from Donner Summit to Fallon, Nev.
Status: Under way.
Contractor: **Morrison-Knudson Co., Inc.,** has from Richmond to Stockton. **Hood Construction Co.** has from Stockton to Rocklin. **Engineers Limited Pipeline Co.** and **J. E. Young Construction Co.** have from Rocklin to Donner Summit and from Donner Summit to Fallon.
Completion: December 1957.
Project: 30 miles of 6-in. and 6 miles of 4-in. from Niland to El Centro, Calif.
Status: Under way.
Contractor: **Hood Construction Co.**
Completion: January 1958.

• **Underground Storage & Exploration, Inc.**
Project: 393 miles of 12-in. L.P.G. line from Moundsville, W. Va., to Newark, N. J., plus 95 miles of 6, 8-in. laterals to Mauch Chunk, Pa., and to Philadelphia.
Status: Proposed.

• **Union Oil Co. of California**
Project: 815-mile line from Rifle, Colo., to Los Angeles refining area.
Status: Proposed.

U.S. Natural-Gas Pipelines

• **American Louisiana Pipe Line Co.**
Project: 7 miles of 16-in. and 5 miles of 12-in. from Second Bayou to Cameron, La.
Status: Under way.
Contractor: **Ford, Bacon & Davis Construction Corp.**
Completion: December 1958.

• **Arkansas Louisiana Gas Co.**
Project: A 300-mile line, plus gathering lines, from Tex.-La. coastal area to northern La., to connect with present system.
Status: Long-range plans.

• **Carnegie Natural Gas Co.**
Project: Two parallel lines to provide coke-oven gas to six Pittsburgh area p'ants: 9 miles of 55-in. and 4 miles of 43-in. each.
Status: Under way.
Contractor: **Williams Brothers Co.**
Completion: January 1, 1959.

• **Chicago District Pipeline Co.**
Project: 52 miles of 30, 36-in. between Joliet and Chicago, Ill.
Status: Approved by FPC examiners.
Completion: 1958.

• **Cities Service Gas Co.**
Project: 75 mi'es of 30-in. from Independence to near Welda, Kan.
Status: Under way.
Contractor: **R. H. Fulton & Co.**
Completion: December 31, 1957.

• **Coastal States Gas Producing Co.**
Project: A 20-mile gathering system from the Rock Island area of Colorado County, Tex., to the United Gas Corp. system.

• **Coastal States Gas Producing Co.** and **Southern Coast Corp.**
Project: 45 miles of 2 to 10-in. in Bee County, Tex. to connect presently shutin fields with Texas Eastern Transmission Corp.'s system.
Status: Planned.

• **Coastal Transmission Corp.**
Project: 562 miles of 12, 20, 22, 24-in. main line and 336 mi'es of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.
Status: Survey and right-of-way work under way. Pipe laying to start January or February 1958.
Completion: January 1, 1959.

• **Colonial Natural Gas Corp.**
Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.

• **Colorado Interstate Gas Co.**
Project: 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pubelo, Colo.; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 24 miles of 22-in. Tex. Panhandle looping.
Status: Approved by FPC examiners.

• **Eastern Shore Natural Gas Co.**
Project: 34 miles of 8-in. and 90 miles of 6-in. from connection with Transcontinental Gas Pipe Line Corp., in Maryland, across entire length of Delaware to Salisbury.
Status: Pending FPC approval.

• **El Paso Natural Gas Co.**
Project: 95 miles of 34-in. San Juan main line loops.
Status: Under way. Partially certificated.
Contractor: **R. H. Fulton & Co.** has 28 miles. **Western Pipeline, Inc.,** has 47 miles. Remainder to be let.
Completion: April 1, 1958.
Project: 18 miles of 12-in. between Good Field in Borden Co., and the East Vealmoor gasoline plant in Howard Co., Tex.
Status: Has temporary FPC approval.
Project: 177 miles of 20-in. from Sonora plant, Sutton County, to Plains plant, Yoakum County, Texas.
Status: Planned. Filed for FPC permit.
Completion: July 1, 1958.
Project: 193 mi'es of 30-in. Permian-San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: September 1, 1958.
Project: 216 miles of 6 to 34-in. and 533 miles of various size in Ariz., Tex., N. M.
Status: Filed for FPC permit.
Project: 38 miles of various size line to make additional gas available at the McElroy-Wilshire p'ant near Crane, Tex.
Project: 500 miles of 34-in. from Twin Falls, Idaho to California border near Las Vegas, Nev.
Status: Planned.
Completion: September 1, 1959.

• **Equitable Gas Co.**
Project: 12 miles of storage line in Lewis Co., W. Va.
Status: Approved.

• **Gulf Interstate Gas Co.**
Project: 10 miles of 12-in. supply loop to Erath field, Vermilion Parish, Louisiana, and 9 miles of various size field lines in Acadia and Vermilion parishes, Louisiana.
Status: Approved.
Project: 10 miles of 20-in. loop in Jefferson Davis and Vermilion parishes, Louisiana, and 3 miles of 6-in. loop in Cameron Parish, Louisiana.
Status: Has temporary FPC approval.

• **Houston Texas Gas & Oil Corp.**
Project: 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 139 miles of 18-in. and 101 miles of 20-in. from Kissimmee to Cutler, Fla.; 642 miles of 3 to 18-in. sa'es laterals in Florida. Main line to join Coastal Transmission's line from McAllen, Tex., to Baton Rouge.
Status: Under way.
Contractor: **Midwestern Constructors** has the 702 miles of 24-in.; **Harbert Construction Corp.** has remainder.
Completion: June 1958.

• **Iron Ranges Natural Gas Co.**
Project: 120 miles of 6, 12-in. from Mesabi Iron Range to northern Minn.
Status: Pending FPC approval.
Completion: November 1, 1958.
Project: 63 mi'es of 12-in. on north shore of Lake Superior.
Status: Pending FPC approval.
Completion: November 1, 1958.

• **Kerr-McGee Oil Industries, Inc.**
Project: 24 miles of 4-in. in Blocks 21, 22, and 32 to connect wells with its Breton Sound production island off the Louisiana coast.

• **Lone Star Gas Co.**
Project: 25 miles of 12-in. from Wichita Fal's to New York City field in Clay County, Tex.
Status: Planned. Approved.
Contractor: Company personnel.
Completion: December 1957.
Project: 29 miles of 16-in. loops in Freestone County, Texas.
Status: Planned.
Contractor: Company personnel.
Completion: December 1957.

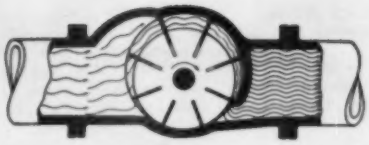
• **Manufacturers Light & Heat Co.**
Project: 3 miles of 12-in. from Wellsville to a point in Saline Township, Ohio; 8 miles of 12-in. in Brook County, W. Va.; 4 miles of 10-in. in Ohio County, W. Va.
Status: Approved.

• **Michigan Consolidated Gas Co.**
Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.;** Floyd Huduall, supt., office at Cadillac.
Project: 60 mi.es of 10 and 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.,** jointly with **H. L. Gentry Construction,** Frank Morris, superintendent, office at Hart, Mich.

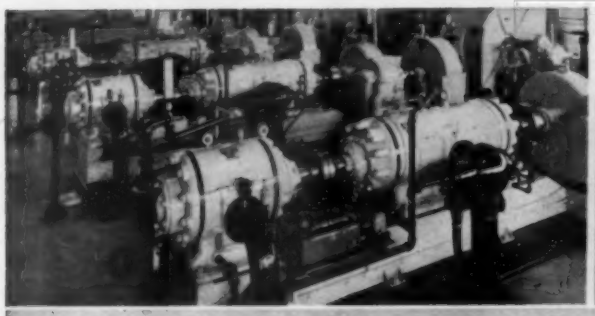
• **Michigan Gas Storage Co.**
Project: 40 miles of 12-in. and 12 miles of gathering lines from Overisal field in Allegan County to Kalamazoo, Mich.
Status: Planned.
Contractor: **Bechtel Corp.**

• **Michigan Wisconsin Pipe Line Co.**
Project: 33 mi'es of 4, 6-in., 2 miles of 12-in., 4 miles of 10-in., and 7 miles of 8-in. gathering lines in LaVerne Field, Harper County, Okla.
Status: Planned. Pending FPC approval.
Completion: October 1, 1958.
Project: 56 miles of 20-in. extension of LaVerne line, Harper County, Okla.
Status: Planned. Pending FPC approval.
Completion: October 1, 1958.
Project: 25 miles of 12-in. and 21 mi'es of 24-in. loops in Wis. and Mich.
Status: Planned. Pending FPC approval.
Completion: October 1, 1958.

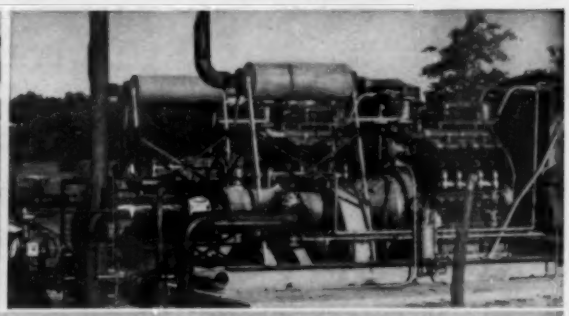
• **Midwestern Gas Transmission Co.**
Project: Line from Portland, Tenn., to Minnesota-Canada border near Emerson, Man.: 670 miles of 24-in., 218 miles of 20-in, 371 miles of 16-in., 115 miles of 12-in., 70 miles of 10-in., 179 miles of 8-in., 147 miles of 6-in., 174 miles of 4-in., 106 miles of 3-in.
Status: Pending FPC approva'.



This simple rotary principle . . . makes the **FULLER** Compressor incomparable



IN-PLANT SERVICES

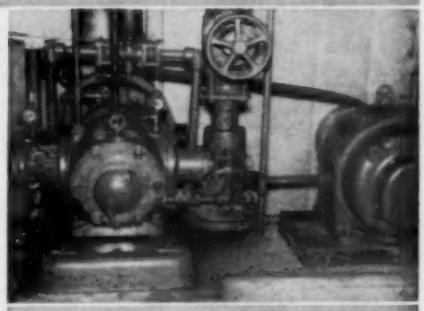


GAS GATHERING

The remarkable record of Fuller Rotary Compressors wherever they are used–indoors or out–goes back more than 25 years. Outstanding dependability in operation is based on simplified design. They consist essentially of an eccentrically mounted rotor in a cylinder to form a crescent which is divided into sections by the rotor blades. Each section formed by the rotor blades carries air through the crescent with no reversal of air flow and with measurable improvement in volumetric efficiency. Rotor blades move smoothly by centrifugal force and automatically compensate for wear.

It's as simple as that and the savings realized are significant–in operation and maintenance. Fuller Rotaries operate indefinitely and are literally carefree. They are available in a range of sizes for plant services, refrigeration and gas gathering.

Clip, fill in and mail coupon for detailed information about Fuller Rotary Compressors for plant service, refrigeration or gas gathering.



REFRIGERATION

COST-SAVING ADVANTAGES

1. Smooth, pulse-free, one-way air flow.
2. Lack of vibration permits use of light foundation.
3. Far fewer moving parts insure low maintenance.
4. Small size for high capacity permits installation in minimum space.
5. Direct drive further reduces space requirements.
6. Valveless design permits continuous-unsupervised operation and greatly reduces maintenance costs.

Fuller Rotary Compressors:

- Maintain original capacity for the life of the machine.
- Provide a high degree of reliability, thereby reducing standby capacity requirements.
- Have few moving parts, thus sharply reducing parts inventory.
- Require minimum supervision and inspection.

It will pay you to compare Fuller Rotaries with other compressors and evaluate Fuller advantages to your operation in terms of annual net savings. Fuller Rotaries are available for industrial pressures to 125 psig and capacities to 3300 cfm. We will be glad to supply you with facts based on actual experience with Fuller installations over the past 25 years.

FULLER COMPANY
132 Bridge St., CATASAUQUA, PA.

Please send me, without obligation, descriptive literature on the Fuller Rotary Compressor. I am specifically interested in:

☐ Plant Services ☐ Refrigeration ☐ Gas Gathering

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FULLER COMPANY
132 Bridge St., Catasauqua, Pa.

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PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930

PIPELINE CONSTRUCTION

• **Mookl Chemical & Gas Corp.** and **Missouri Transmission Corp.**

Project: 425 miles of 16-in. from Pottawatomie County, Okla., to St. Louis. Mookl, 1341 S. Boston, Tulsa, will build Okla. section. Missouri Transmission, Springfield, Mo., will build the Mo. section.

Status: Tentative plans before FPC.

Contractor: **Fish Engineering Corp.** and **DeGolyer & MacNaughton** are preparing engineering and reserves reports.

• **Natural Gas Pipeline Co. of America**

Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., plus a gathering system.

Status: Under way.

Contractor: **R. H. Fulton & Co.** has Red River crossing in northern Montague County. **Fulton & Brodie, Inc.,** has gathering system. **Eastern Pipeline Contractors** has completed 86 miles of 20-in. from Bridgeport, Tex., to Healdton, Okla. **River Construction Corp.** has completed 86 miles of 26-in. from Mountain View, Okla., to Wheeler, Tex., and 87 miles of 26-in. from Wheeler to Fritch, Tex. **H. B. Zachry Co.** has completed 88 miles of 26-in. between Ringling and Mountain View, Okla.

Completion: January 1, 1958.

Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and 91 miles of 30-in. loops along parts of its main line.

Status: Approved by FPC examiner.

Project: 337 miles of 30-in. between Fritch, Tex., and Beatrice, Neb., and 59 miles of 36-in. between Beatrice and Joilet, Ill., along existing system.

Status: Pending FPC approval.

Completion: 1959.

• **Niagara Mohawk Power Corp.**

Project: 196 miles of 2 to 16-in. transmission and distribution mains to service areas in central, eastern and northern New York.

Status: Under way.

Contractor: Various.

Completion: December 31, 1957.

• **North Carolina Natural Gas Corp.**

Project: 630 miles of 2 to 16-in. from near Mooresville, eastwardly across N. C.

Status: Under way.

Completion: Spring 1958.

• **Northern Natural Gas Co.**

Project: 23 miles of 24-in. loops in Nebr. and Iowa; 43 miles of 30-in. loops in Kans., Nebr., and Iowa; 169 miles of 20-in. from Farmington, Minn., to Superior, Wis.; 44 miles of 16-in. in Duluth-Superior-Iron Ranges area.

Status: Pending FPC approval.

Project: 73 miles of 20-in. from Savanna Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

Status: Proposed.

Project: 1,090 miles of 2 to 16-in. branch lines to serve communities in Minn., Iowa, S. D., Nebr., Wis.

Status: Filed with FPC March 18, 1957.

Project: 61 miles of 30-in. loops between Sunray, Tex., and Clifton, Kans.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: Late December 1957.

Project: 28 miles of 30-in. loop in Tex. and Kans.

Status: Pending FPC approval.

• **Northern Utilities Co.**

Project: 35 miles of 16-in. in Fremont-Natrona County, Wyoming, area; 8 miles of 12-in. around Casper; 6 miles of 8-in. from Sand Draw gas field to Beaver Creek field; 12 miles of 6-in. from Beaver Creek field to the system servicing the Riverton-Lander area.

Status: Planned.

• **Offshore Gathering Corp.**

Project: 364 miles in Gulf of Mexico off Louisiana: 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)

Status: Application pending with FPC.

• **Olin Gas Transmission Corp.**

Project: Mississippi River 3 and 8-in. crossing near White Castle, La.

Status: Under way.

Contractor: **Houston Contracting Co.,** A. J. Slovack and R. E. Thornton, supts., office at White Castle.

• **Pacific Gas & Electric Co.**

S. E. HUEY & Co.

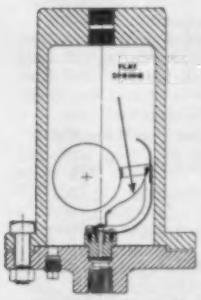
ENGINEERS & SURVEYORS

OUACHITA BANK BLDG.

MONROE, LA.

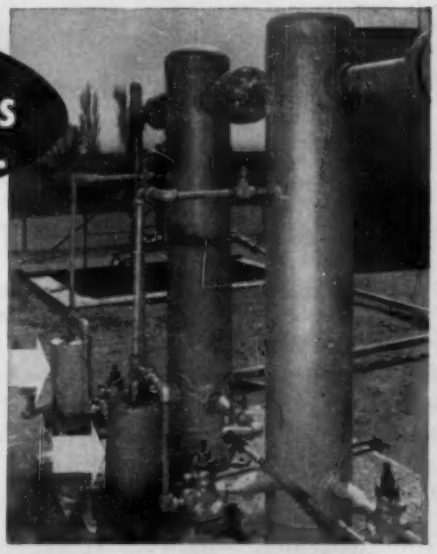
SURVEYING & MAPPING

PIPE LINE SURVEYS



TO DRAIN WATER FROM GAS SYSTEMS Safely, without Gas Loss...

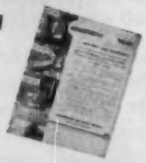
use ARMSTRONG "SNAP-ACTION" TRAPS on Scrubbers, Drip Pockets, Aftercoolers



HERE'S a dependable, positive-acting trap: when sufficient water accumulates in the trap to float the ball and overcome the tension in the bowed flat spring shown in the drawing above, the spring snaps the valve wide open. As water shoots out the float drops, bending the spring until it snaps the valve shut. Thus, with the valve either wide open or tightly closed there is no hunting or dribbling nor will fine dirt particles prevent the valve from seating tightly. You get fast, automatic drainage with no gas loss. These traps have been widely proved in gas system and compressed air service and are *guaranteed* to satisfy. Body and cap are forged steel for working pressures to 1000 lbs. Valve and seat are hardened chrome steel; other interior parts are corrosion-resistant stainless. Ask your local Armstrong Representative for additional details and prices on the No. 71-315 trap.

SEND FOR BULLETIN

Bulletin No. 289 gives complete information on Armstrong "Snap-Action" and regular ball float traps as well as on Armstrong Inverted Bucket Traps for draining water from gas. Ask for a copy.



ARMSTRONG MACHINE WORKS

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ARMSTRONG GAS TRAPS

PIPELINE CONSTRUCTION

Project: 138 miles of 34-in. looping of the Topock-Milpitas line.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.**
Completion: February 1958.
Project: 5 miles of 16-in., 160 miles of 12-in., 8 miles of 8-in. from Corning to Eureka, Calif.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.** and **Alex Robertson Co.**
Completion: June 1958.
Project: 13 miles of 12-in. and 2 miles of 10-in. from Santa Cruz to Davenport, Calif.
Status: Under way.
Contractor: Company personnel will build part; remainder to be let.
Completion: January 1958.

- **Pacific Lighting Gas Supply Co.**
Project: 83 miles of 34-in. from North Coles Levee to Newhall, Calif.
Status: Planned. Approved by Public Utilities Commission.
Completion: July 1, 1958.

- **Pennsylvania Gas Co.**
Project: 23 miles of 10-in. in Erie County, Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pa., 30 miles of branch lines, several small distribution lines.
Status: Has FPC permit.

- **Permian Basin Pipeline Co.**
Project: 29 miles of 10-in. gathering lines from Crane and Pecos counties to McCamey, Tex.
Status: Under way.
Contractor: **Lone Star Constructors, Inc.**

- **Phillips Petroleum Co.**
Project: 30 miles of 3 to 8-in. in Moore, Hutchinson, Sherman, Hansford, and Gray counties, Tex., and in Texas County, Okla.
Status: Planned.
Contractor: Various.
Completion: January 1, 1958.

- **Piedmont Gas Co.**
Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.
Status: Has FPC approval.

- **Southern Natural Gas Co.**
Project: 335 miles of 4 to 26-in. in southern La.
Status: Pending FPC approval.
Completion: December 1, 1958.
Project: 45 miles of 6 to 10-in. in southern La.
Status: Pending FPC approval.
Completion: December 1, 1958.
Project: 25 miles of 6 to 20-in. in southern La.
Status: Pending FPC approval.
Completion: December 1, 1958.

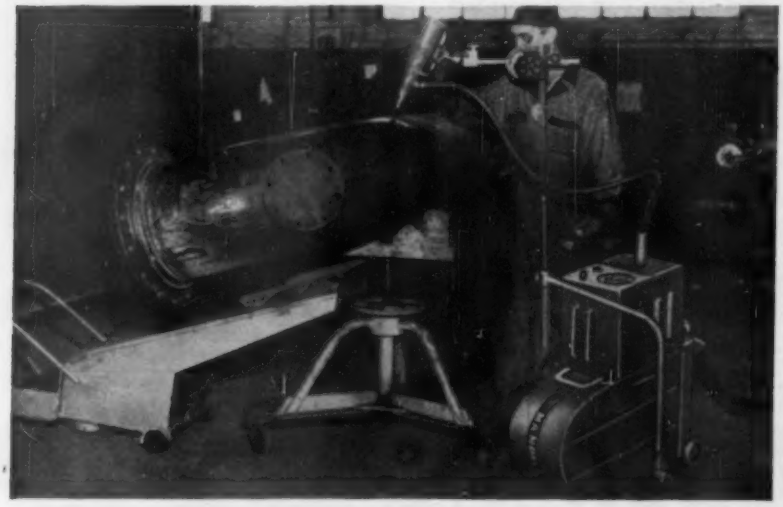
- **Tennessee Gas Transmission Co.**
Project: 556 miles of 30-in. from Mississippi Delta area south of New Orleans to Portland, Tenn.
Status: Has temporary FPC approval.
Project: 76 miles of 24-in. from Coudersport, Pa., to Hamburg, N. Y.
Status: Has temporary FPC approval.
Project: 163 miles of 30-in. and 101 miles of 26-in. from Portland, Tenn., to near Lancaster, Ky.; from Winchester, Ky., to Morehead, Ky.; from Catlettsburg, Ky., toward Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from Morehead, Ky., to Catlettsburg, Ky.
Status: Has Temporary FPC approval.

- **Texas Eastern Transmission Corp.**
Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris County, Texas.
Status: Has FPC approval.
Project: 140 miles of 30-in. between Kosciusko, Miss., and Uniontown, Pa., 105 miles of 30-in. between Opelousas, La., and Kosciusko, 22 miles of 14-in. supply line in La.
Status: Pending FPC approval.

- **Transcontinental Gas Pipe Line Corp.**
Project: 202 miles of 36-in. and 132 miles of 30-in. main line loop; 164 miles of 24-in. to connect storage in Pa.; 202 miles of 10 to 20-in. gathering lines in southeast La.; 48 miles of 10 to 20-in. to tap gas off Tex.
Status: Pending FPC approval. Planned to start February 1, 1958.
Project: 57 miles of 36-in. main line loop.
Status: Pending FPC approval. Planned for 1959.
Project: 57 miles of 30, 36-in. loops in La., Miss., Ala., Ga., S. C., and 247 miles of mostly 24 and 16-in. laterals in Tex., and La.
Status: Under way.
Contractor: **H. B. Zachry Co.** and **Panama-Williams Corp.** have gathering lines.
Completion: January 1958.
Project: 87 miles of 24-in. laterals, plus small gathering lines connecting seven Louisiana fields with the New Orleans area.
Status: Pending FPC approval.

- **Trans-Western Pipe Line Co.** (Warren Petroleum, Monterey Oil Co.; J. R. Butler).
Project: A line from Four Corners area to Calif. border.
Status: Proposed.

- **United Gas Pipe Line Co.**
Project: 18 miles of 12-in. from Lirette-Mobile line in Jackson County, south to Bayou Casottee industrial area east of Pascagoula, Miss.
Status: Approved.
Project: 202 miles of 30-in. loop from



SPEED AND X-RAY QUALITY WELDS FOR FLANGES AND FITTINGS WITH A "SQUIRT" WELDER

Greater speed and X-ray quality are simple to achieve with the Manual Lincolnweld "Squirt"—a semi-automatic, submerged arc welder. Lincolnweld offers:

- **Higher currents** for deep penetration and speed.
- **Accurate control** to assure the best weld possible.
- **Versatility** for easy change-over from one job to the next.
- **Low cost.** Lincoln "Squirt" unit costs less than $310 anywhere in the country. Operates from standard Lincoln 600 amp. motor-generator, 500 amp. rectifier, or 600 amp. engine welders.

Other factors, such as more operator comfort, self-cleaning welds and ease of use without expensive fixtures, make additional contributions to lower welding costs.

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THE LINCOLN ELECTRIC COMPANY
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The World's Largest Manufacturer of Arc Welding Equipment

PIPELINE CONSTRUCTION

southeast Louisiana, to Mobile, Ala.
Status: Pending FPC approval.

Canadian Crude-Oil Pipelines

- **Act Oils, Ltd.**
  Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Bella Coola, B. C.
  Status: Request has been made for permit from the B. C. government.
- **B-A Alberta Pipe Line, Ltd.**
  Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.
  Status: Pending approval.
- **Gibson Petroleum Co., Ltd.**
  Project: 25 miles of line from Willesden Green field to near Rimbley, Alta.
  Status: Has Alberta Government approval.
- **Royalite Oil Co., Ltd.**
  Project: 250-mile line from Athabasca oil sands, northeastern Alta., to Edmonton.
  Status: Long-range plans.
  Completion: 1960.
- **Westspur Pipe Line Co.**
  Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields; 34 miles of 4, 6, 8-in. gathering lines.
  Status: Has requested permit from Board of Transport Commissioners.
  Contractor: **Majestic Contractors, Ltd.,** Jeff Minter, supt., office in Estevan, Sask.
  Completion: No date set.

Canadian Products Pipelines

- **Hydrocarbons Pipeline Co.**
  Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.
  Status: Has permit from Parliament of Canada. Seeking approval by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board.
  Construction consultants: **Dutton-Williams Brothers, Ltd.,** and **A. D. Little Co.**

Canadian Natural-Gas Pipelines

- **Alberta Gas Trunk Line Co., Ltd.**
  Project: 637 miles of 34 to 16-in. gathering lines in Alberta.
  Status: Under way.
  Contractor: **Dutton - Williams Brothers, Ltd.,** has preliminary studies, design and management - engineering. **Universal Pipe Line, Ltd.,** subsidiary of Mannix, Ltd., jointly with **Marine Pipeline & Dredging Co.,** has crossing of Red Deer River near Cavendish, Alta., J. Hysuick, spread superintendent, office at Empress. **Fulton Banister, Ltd.,** has completed 17 miles of 34-in. west from Burstall, Sask., to near Cavendish, Alta., and 100 miles of 18-in. north to Bindless and Provost fields.
- **Alberta & Southern Transmission Co., Ltd.**
  Project: 1,300 miles of 36-in. from Alberta to San Francisco area plus 47 miles of gathering lines.
  Status: Planned.
  Completion: 1960.
- **Northern Ontario Pipe Line Crown Corp.**
  Project: 675 miles of 30-in. from the Ontario-Manitoba border to near Kapuskasing, Ont. (part of the 2,250-mile Trans-Canada line; will be leased to Trans-Canada Pipe Line Co. with option to buy.) 360 miles from Port Arthur to Kapuskasing remains to be laid in 1958.
  Status: Under way.
  Contractor: **Nelen, Ltd.; Majestic Contractors, Ltd.; River Construction Corp.; Mannix, Ltd.; and Morrison Shivers, Ltd.**
  Completion: November 1958.
- **Northwestern Utilities, Ltd.**
  Project: 72 miles of 16-in. from Pembina field to Edmonton, Alta.
  Status: Approved. Planned for 1958.
  Completion: 1958.
- **Trans-Canada Pipe Lines, Ltd.**
  Project: 491 miles of 30-in. from Kapuskasing to Toronto.
  Completion: November 1958.
- **Westcoast Transmission Co., Ltd.**
  Project: 42 miles of 20-in. and 100 miles of 30 in. from Savanna Creek area, Alta., to Canadian-Idaho border.
  Status: Planned.
  Completion: November 1, 1958.
  Project: Looping of present system to double capacity.
  Status: Planned.

Foreign Crude-Oil Pipelines

- **Assam Oil Co.**
  Project: 600 miles of 20-in. from Nahorkatiya field in Upper Assam to Barauni, India, to connect with Burmah Oil Co.'s proposed 250-mile line from Barauni to Calcutta.
  Status: Survey of possible routes under way.
  Contractor: **Pipe Line Engineering Co.** is making survey.
- **Bolivia-Paraguay.**
  Project: 500 miles of 6-in. from Southeast Bolivia to a proposed refinery on Paraguay River, and later to Asuncion.
  Status: Planned .
  Contractor: **Five Lilles,** a French Combine.
- **Burmah Oil Co., Ltd.**
  Project: 250 miles of 20-in. from Barauni to Calcutta, India, extending Assam Oil Co.'s proposed line.
  Status: Survey under way.
  Contractor: **Collins Construction Co.** is surveying locations for some 40 river crossings.

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Because excessive heat shortens motor life and seriously reduces the effectiveness of lubrication, R&M "All-Weather-40" motors are designed to run cooler . . . even in the blazing sun! High velocity clean-sweep ventilation between the frame and windings prevents the sun's rays from adding appreciable internal heat. Under severest conditions, heat rise never exceeds 40° C.
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WORTHINGTON CORPORATION, Oil City, Pennsylvania

PIPELINE CONSTRUCTION

- **Caltex**

Project: 30 miles of 30-in. from Duri field in Sumatra to Dumai where a deepwater terminal will be built. Line wil be extended 35 miles to Minas field later.

Status: Under way.

Contractor: **Bechtel Corp.**

Completion: May 1958.

- **Colombian Petroleum Co.**

Project: 42 miles of 6-in. from Tibu field to Rio de Oro in Colombia.

Status: Under way.

- **C.R.E.P.S., Societe Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal), and Cie. Francaise des Petroles Algerie**

Project: 105 miles of 6-in. from Hassi Messaoud and Edjele, Algeria, to the railhead at Touggourt.

Status: Planned.

Completion: 1958.

Project: 450 miles of 16-in. from Edjele field in southeastern Algeria to a Mediterranean port on the Libyan coast.

Status: Pipe has been ordered.

- **Creole Petroleum Corp.**

Project: 100 miles of 30-in. from Temblador field to Caripito in Venezuela.

Status: To start work early in 1958.

Contractor: **Pipe Line Engineering Co.** and **Oklahoma Pipe Line Constructors,** R. J. O'Connell, supt., office at Maturin.

Completion: April 30, 1958.

- **Elburz Oil Corp.**

Project: 1,000 miles of 38-in. to move Qum crude to the Mediterranean.

Status: Planned.

- **Iranian Consortium.**

Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bandar Mashur line.

Status: Planned.

Project: 50 miles of 26, 28-in. from Gach Saran field to new terminal on Persian Gulf.

Status: Planned.

- **Iraq Petroleum Co.**

Project: About 600 miles of up to 40-in. from Kirkuk field through Iraq to Turkish port of Iskenderun on the Mediterranean.

Status: Proposed. Survey completed.

- **Mene Grande Oil Co.**

Project: 97 miles of 30-in. from fields in Eastern Venezuela to Puerto La Cruz.

Status: Under way.

Contractor: **Fulghum Contracting Corp.** has 22 miles between Oficina and Anaco. **Williams Brothers Co.** has remainder.

Completion: First quarter 1958.

Project: 45 miles of 24-in. from Oficina to Melones, Venezuela.

Status: Planned.

Completion: First quarter 1958.

- **Middle East Pipeline**

Project: 1,500 miles of 38 and 40-in. line from Persian Gulf to Mediterranean at Iskenderun, Turkey.

Status: Proposed.

- **North-West Oil Pipeline Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)

Project: 230 miles of 28-in. from refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.

Status: Work to start early 1958.

Contractor: **W. M. Lyles** in joint venture with two German steel firms.

Completion: November 1958.

- **Royal Dutch-Shell**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, Netherlands, and Belgium. Main trunk to be 30-in.

Status: Company is considering project together with several other companies.

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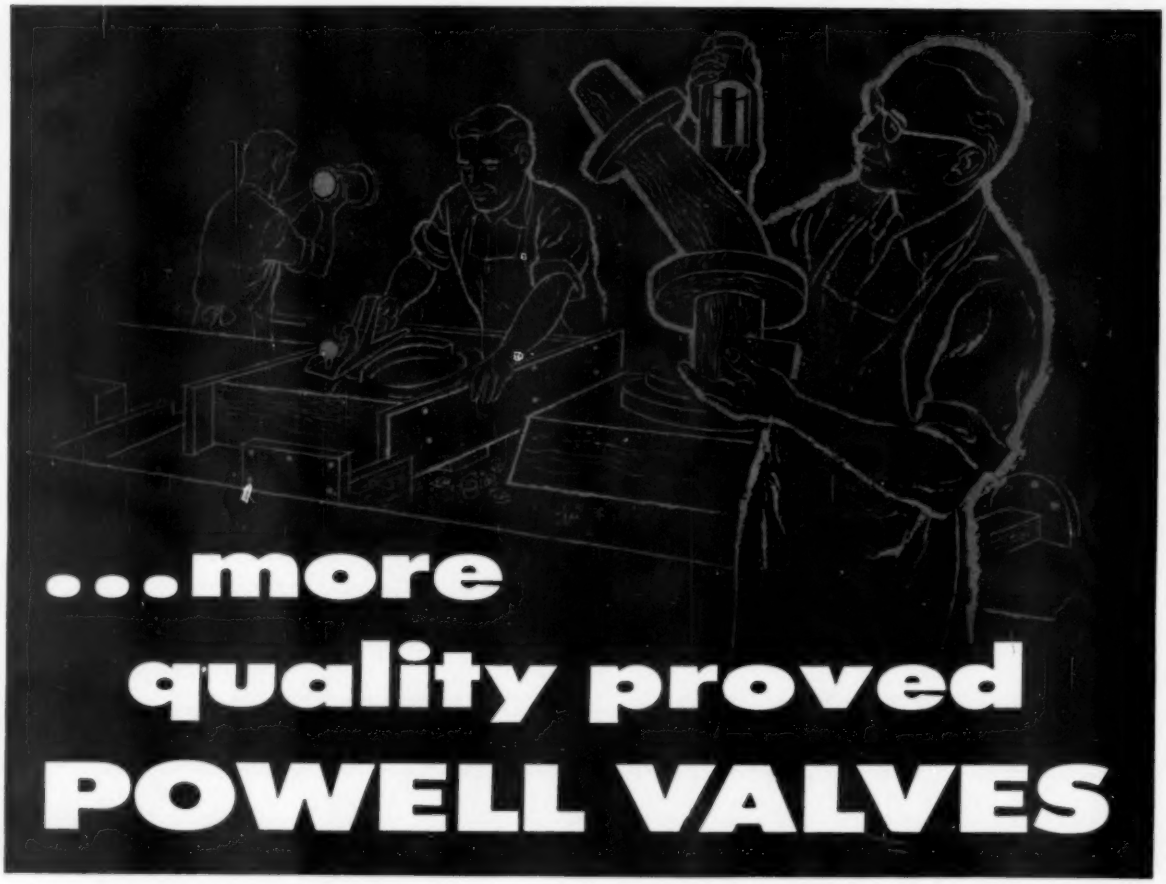

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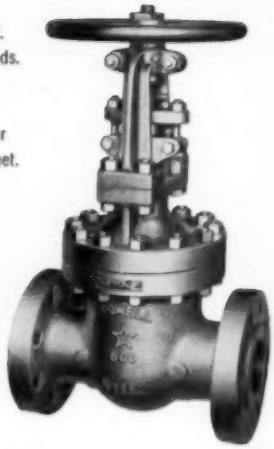
Fig. 2201—175-Pound W.O.G. Semi-Steel Lubricated Plug Valve.

Fig. 86196—Steel "LPG" Horizontal Lift Check Valve for 400 W.O.G.

Fig. 375—Bronze Gate Valve for 200 Pounds W.S.P. Union Bonnet. Inside Screw Rising Stem.

Fig. 6003—Steel O.S.&Y. Gate Valve for 600 Pounds.



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PIPELINE CONSTRUCTION

- **Standard-Vacuum Petroleum Maatschappij**
  Project: 94 miles of 8-in. from Lirik field, Central Sumatra, to deep-water terminal on Siak River, near Buatan. A 3-in. hot-water "defroster" line will be laid under the 8-in. to heat the heavy crude.
  Status: Under way.
  Completion: Late 1957.
- **Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie**
  Project: Line in Sahara Desert area to move oil from Hassi Massaoud field. Two routes possible: 200 miles from the field northwest to Laghouat; 260 miles from the field to the north and slightly east to Biskra.
  Status: Under study.
- **Union of Soviet Socialist Republic**
  Project: 2,300-mile Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Balkal.
- **Yacimientos Petroliferos Fiscales** (Argentina)
  Project: 932 miles of 12-in. from Campo Duran to San Lorenzo.
  Status: Planned.
  Contractor: **TIPSA** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.)
  Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
  Status: To start 1st quarter 1958.
  Completion: Mid-1960.
- **Yacimientos Petroliferos Fiscales Bolivianos**
  Project: 174 miles of 10-in. and 44 miles of 8-in. from Sicasica, Bolivia, to Arica, Chile.
  Status: Planned.
  Contractor: **Williams Brothers Co.** and **Telescopic Pipe Line.**
  Completion: October 1958.

Foreign Products Pipelines

- **Empresa Nacional de Petroles** Government of Chile and Cia de Petroles de-Chile (Copec), et al.
  Project: 75 miles of 10-in. from Chile's coastal refinery at Concon to Santiago.
  Status: Under way.
  Contractor: **Williams Brothers.**
  Completion: Early 1958.
- **Mene Grande Oil Co.**
  Project: 60 miles of 6-in. L.P.G. line from Anaco to Puerto La Cruz, Venezuela.
  Status: Planned.
  Completion: Fourth quarter 1957.

Foreign Natural-Gas Pipelines

- **Attock Oil Co.**
  Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.
  Status: Planned.
- **City of Riyadh, Saudi Arabia**
  Project: 182 miles of 10-in. from Ghawar field to Riyadh.
  Status: Planned.
- **Cuban Gas Transmission Co.**
  Project: 650-mile pipeline from Campeche area of Mexico across Yucatan and on the ocean floor to Havana, Cuba; 150 miles would be submarine.
  Status: Being studied by Ebasco Services.
- **Gaz de France**
  Project: 550 miles of 16 to 24-in. from Lacq field, southwestern France, to Paris, plus a 10-in. terminal to Nantes and 12 to 16-in. laterals to Lyons, making a 1,000-mile system.
  Status: Under way.
  Contractor: French contractors.
  Completion: First stage in 1958; complete system in 1960.
- **NIOGAS**
  Project: 160 miles of 6, 8, 10, and 12-in. from Fischamend field to Vienna and other Austrian cities.
  Status: Under way.
  Contractor: **Williams Brothers Co.** and **Costain-John Brown, Ltd.**
  Completion: Fall 1958.
- **Petroleos Mexicanos.**
  Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey.
- **Sui Gas Transmission Co.**
  Project: 217 miles of 16-in. from Sui gas field to Moultan, Pakistan.
  Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang, Magiana, and Montgomery.
  Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.,** of London.
  Project: 145-mile line from Sylhet to Dacca, East Pakistan.
  Status: Under consideration. If approved construction could start December 1958.
- **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venzuela.**
  Project: 207 miles of 26-in. from Anaco fields to Caracas.
  Status: Under way.
  Contractor: **Williams Brothers Co.** has part.
  Completion: Spring 1959.
- **Yacimientos Petroliferos Fiscales** (Argentina)
  Project: 1,015 miles of 24-in. from Camp Duran to Buenos Aires.
  Status: To start first quarter 1958.
  Contractor: **TIPSA** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.)
  Completion: Mid-1960.

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Among the

Drilling Contractors

Kern Drilling Co., Inc., Magnolia, Ark., has a rig working for McAlester Fuel Co., of Magnolia, Ark., on a Smackover test in Northwest Stamps field, Lafayette County, Arkansas. Production so far in this field has been from the shallower Tokio sand. The new test, 1-D Shewmake, in 32-15s-23w, is scheduled to go to 7,400 ft. Location is about 2 miles northwest of Stamps.

Sterling Drilling Co., Sterling, Kans., has a contract for a 5,700-ft. Mississippian test to be drilled at a remote wildcat location in southwestern Hamilton County, in far-western Kansas, near the Colorado line. Its location (1 Hatcher, in 21-26-32) is 9 miles southwest of Helfrich field, nearest production. It is 17 miles south of Coolidge.

Howard Parker Drilling Co., Houston, has a new operation in the deep development play going on off the north and northwest side of the old South Liberty field, South Texas. It is a 11,000-ft. test for Scurlock Oil Co. Location is inside the city limits of Liberty at 1-E Wirt Davis Estate.

Circle Drilling Co., Lake Charles, La., has two more deep-drilling jobs under way in South Louisiana. One is a confirmation test for the recently completed gas discovery well it drilled for Texas Gas Exploration Co. on its Noel lease south of Abbeville, Vermilion Parish. Location is about 2,000 ft. east of the discovery well, production from a 10,900-ft. sand. The other is a 10,300-ft. test for Bradco Oil & Gas Co. and Slick Oil Co. off the south side of South Bayou Mallet field.

Sunnyland Contracting Co., Rayne, La., has contracted for a 11,300-ft. test to be drilled for Texas Crude Oil Co. at a wildcat location 2 miles southwest of Frisco field, 20 miles west of Baton Rouge, in southern Pointe Coupee Parish, Louisiana. Its location is for 1 Bergeron, in 119-6s-9e.

H. E. T. Drilling Co., Houston, is to drill another well for Austral Oil Exploration Co. in the recently discovered South Bourg field, 10 miles southeast of Houma, in Terrebonne Parish, southeastern Louisiana. The new operation, 1 Vice-Duplantis, is the east offset to the discovery well, completed last August in a 12,550-ft. sand. Permit calls for a 14,000-ft. test.

Signet Drilling Co. has a new contract operation scheduled at a wildcat location 2 miles northwest of Dinero, in Live Oak County, South Texas. It is a 5,500-ft. test for A. C. Black at 1 Wann, in the S. Simmons Survey. Location is a half mile south of production in Freeman field.

Golden Meadow Well Service Co., New Orleans, has taken on an 11,500-ft. drilling contract in Jefferson Parish, South Louisiana. It is a wildcat test Reese E. Carter, of New Orleans, is undertaking about midway between Lafleur and Barataria fields. It is about 2 miles east of the latter, and northwest of the former. Location is for 1 Pizani, in 37-15s-24e.

Longhorn Drilling Corp., Three Rivers, Tex., is contractor on a significant exploratory test being started in the Lopena area of southern Zapata County, in Texas' Rio Grande Valley. Drilling is for Gulf Resources Corp. of Dallas, at 1 Ramon Ramirez, in the Christoval Ramos Survey. The test is projected to lower Wilcox sands about 10,200 ft.

Hunt Drilling Co., Corpus Christi, is getting under way on a deep contract job 4 miles southeast of Gregory, in southern San Patricio County, South Texas. It is a 9,500-ft. test for a group composed of A. G. Hill, Reynolds Mining Corp., and New Seven Falls Co. Location, at 1 Freen Estate, in Section 44, T. T. Williamson Survey, is about a mile southwest of Enos Cooper field.

W. C. Fatjo Drilling Co., Lafayette, La., has a new wildcat operation in the northwest corner of the western arm of St. Landry Parish, South Louisiana. It is a 9,100-ft. test for Hunter Co. at 1 Duplechen, in 14-6s-1w. Location is about 6 miles southwest of Mamou field, in Evangeline Parish, and about the same distance northeast of Richie field, in Acadia Parish.

Crow Drilling & Producing Co., Shreveport, has another test scheduled for the Walnut Hill area of Lafayette

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County, southwestern Arkansas, where it is drilling for Gulf Oil Corp. Its new location is for 2 Booker Unit, in 15-19s-25w. This is about a half mile southeast of production. Crow now is finishing up at Gulf's 1 Bishop Unit, about ¾ mile northwest. Both jobs are 5,900-ft. Mitchell sand wells. Crow has an interest in both wells.

Bryant-Hayward Drilling Co., Oklahoma City, will drill An-Son Petroleum Co.'s second well in the new Alamo field, southeast of Noble, in Cleveland County, Oklahoma. Contract is for a 7,650-ft. Tulip Creek tst. Location is for 1-B Schock, in 4-7n-1w, offsetting An-Son's discovery well, 1 Perrine, completed last June in Second Wilcox sand at 7,324-27 ft.

Sikes-Burckhalter Drilling Co. has taken a well-deepening job in the Butterfly district of Garvin County, Oklahoma. It is for Ambassador Oil Co. at 1 John Butterly, in 22-1n-1e. Hole, abandoned at 6,500 ft. in 1950, will be carried to 8,700 ft. for a look at the Arbuckle.

Gordon Drilling Co., Mount Pleasant, Mich., has the contract on a Richfield test Don F. Rayburn and C. W. Collin are starting in the old Vernon field, in Isabella County, Michigan. The test is at 1 House, in 21-16n-4w. Operators are prepared to go to 5,500 ft., or deeper. This will be the first deep test in this area.

Milton Crowe, Inc., Shreveport, is on a new wildcat operation in northern Bossier Parish, North Louisiana. It is a 6,500-ft. Pettet test, at 1 Cheatham et al, in 5-23n-13w, about 2⅝ miles west of Arkana field. Crowe is drilling the test as contractor and joint operator with John S. Neilson and A. W. Ellis. Location is about 6½ miles northwest of Plain Dealing, and slightly less than a mile from the Arkansas line.

Globe Drilling Co., Tyler, Tex., has two new contract operations under way in East Texas. Both are wildcat tests with the Woodbine formation as their objective. One is for **Coats Drilling Co.,** of Gladewater, Tex., in northwestern Houston County. It is at 1 Whitechurch, in the D. W. Reaves Survey, about 12½ miles northwest of Grapeland, and 8½ miles southwest of Elkhart. The other is for C. L. Ewell, of Palestine, Tex., in southern Anderson County. It is at 1 Casey, in the Jesse Gibson Survey, about 2½ miles northeast of Slocum. Both call for 6,000 to 6,500-ft. drilling.

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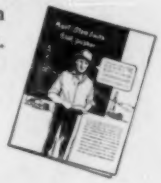

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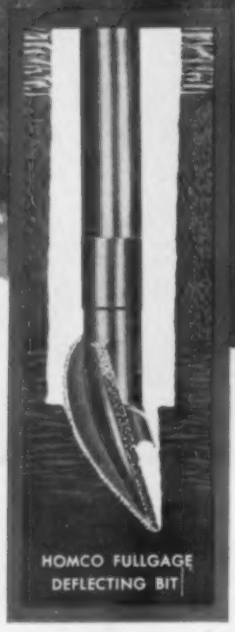

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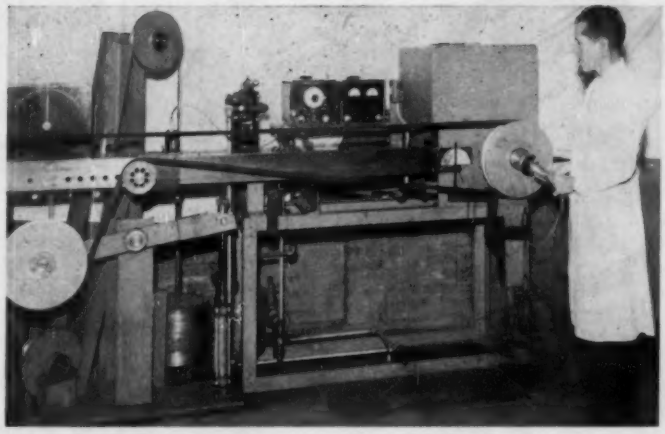

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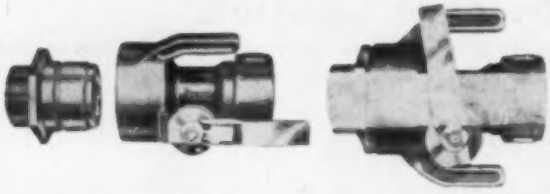

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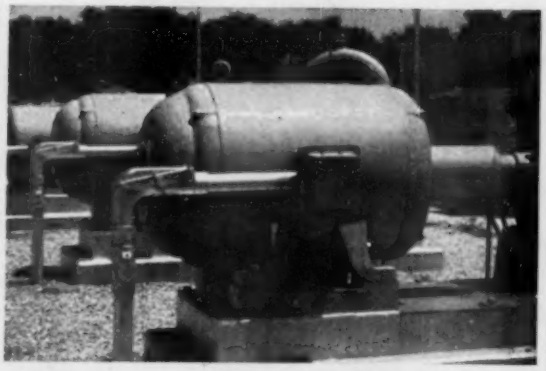

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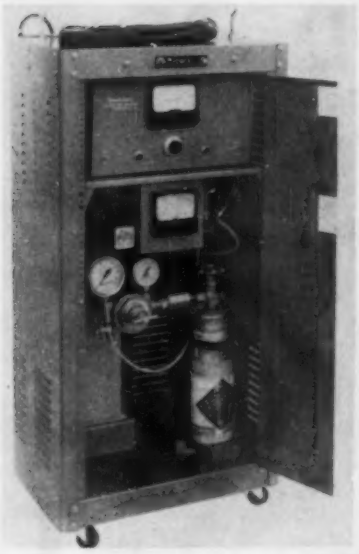

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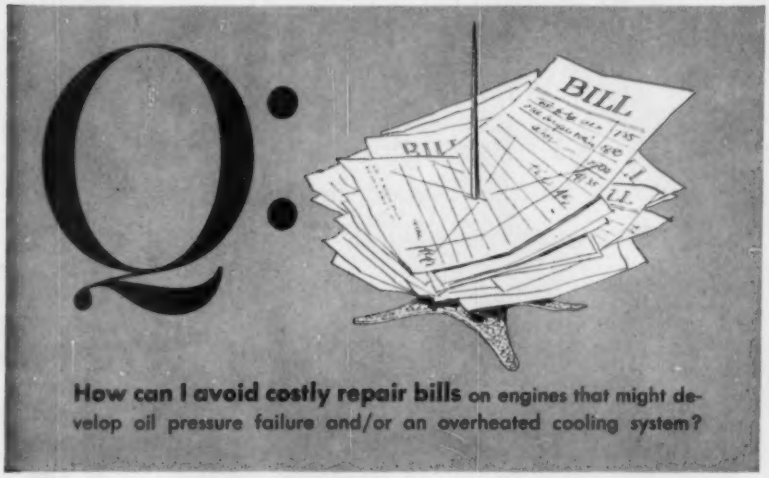

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PENN SAFETY CONTROL
that will either warn you of such existing danger or automatically stop the engine operation before damage occurs.

See your PENN jobber and he'll show you how simple it is to have this protection on present or new engines. For low-cost engine insurance . . . Penn is your best buy!

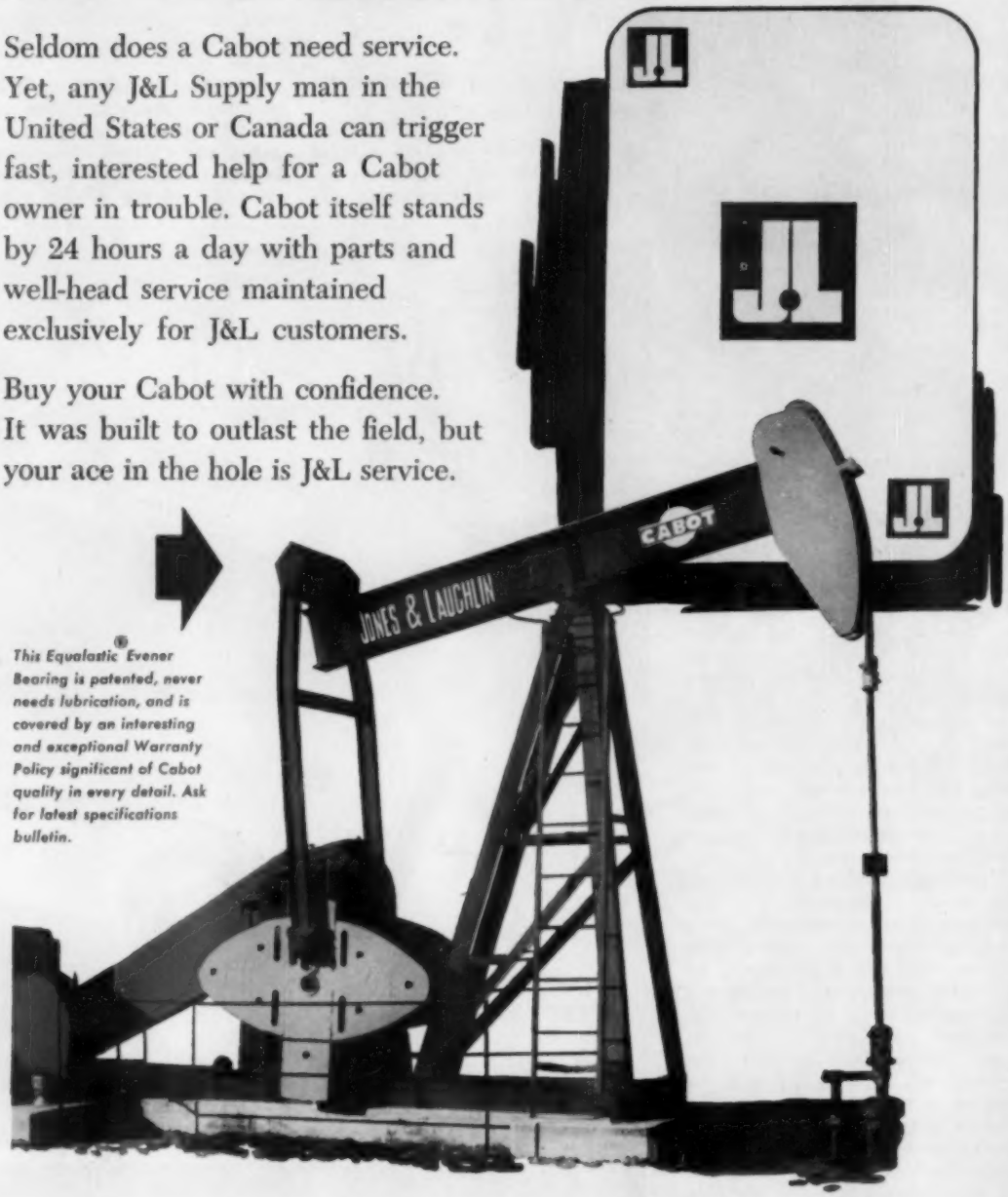
PENN CONTROLS, INC. Goshen, Indiana

FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

ACE IN THE HOLE for CABOT owners

Seldom does a Cabot need service. Yet, any J&L Supply man in the United States or Canada can trigger fast, interested help for a Cabot owner in trouble. Cabot itself stands by 24 hours a day with parts and well-head service maintained exclusively for J&L customers.

Buy your Cabot with confidence. It was built to outlast the field, but your ace in the hole is J&L service.



This Equalastic® Evener Bearing is patented, never needs lubrication, and is covered by an interesting and exceptional Warranty Policy significant of Cabot quality in every detail. Ask for latest specifications bulletin.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN SUPPLIES

40

SHOWCASE . . .

New Equipment

Pipe, Fittings Have Teflon Lining

The Teflon-lined pipe, ells, and tees incorporate a number of innovations, the maker announces. All three products have flanged-end connections. The pipe is offered in 10-ft. lengths.

The Teflon lining extends over the entire raised-face area of the flanges to make flat and smooth mating surfaces for leakproof connections. This eliminates the need for an additional gasket flange. In the tees, the Teflon lining is solid and weldless.

The Teflon-lined products are especially suitable for handling corrosive acids, alkalis, or other products where transfer of undesirable substances from the pipe presents a problem. The lining material will withstand pressures up to 400 psi. and temperatures ranging from —90° to 400° F. **Write or call: John L. Dore Co., 5406 Schuler Street, Houston, Tex., for details on Teflon-lined pipe and fittings.**

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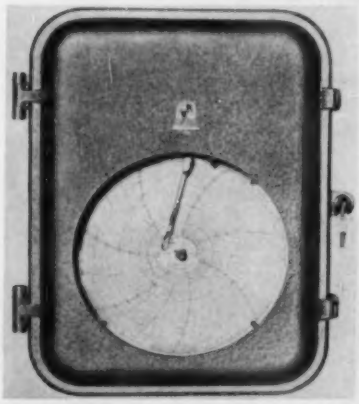


Recording Thermometer For LACT

Designed for automatic recording of oil temperature in lease-automatic-custody-transfer operations (LACT), the Model TRW instrument is suitable for all-weather operation. A lock safeguards both the mechanism and the recording charts.

Utlizing the mercury-expansion principle, the instrument records on a circular chart the minute-by-minute temperature changes in crude oil at the time of delivery to the pipeline.

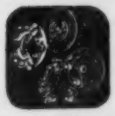
Suspended vertically in the tank, the mercury bulb samples the average temperature of the oil for delivery to an accuracy of ½ per cent of scale range. Simple and rugged, the lever system transmits the mercury expansion from a diaphragm to a recording arm on which a pen is mounted. The special red ink furnished withstands a range of temperatures without congealing.

The instrument comes with 24 and 48-hour or 7-day chart movements. These can be either electric or spring driven. A sturdy, weatherproof cast-aluminum case houses the mechanism. The capillary of the thermal element emerges from the back of the case through a pipe nipple. The element is easily field replaced. **Write or call: Partlow Corp., 503 Campion Road, New Hartford, N. Y., for Bulletin 601.**

ROCKFORD

LONG LIFE Heavy-Duty POWER TAKE-OFF

ELIMINATES PILOT BEARING


Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

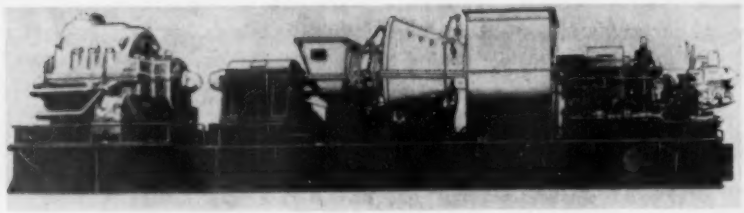
Speed Reducers

Eighty five percent of all take-off failures that are caused by misalignment, lack of lubrication, overload and other reasons—stem from the pilot bearing. By eliminating the pilot bearing—in this new Oil Field type, long-life, extra heavy-duty power take-off—ROCKFORD has reduced down-time to a minimum. This improvement will help increase the trouble-free work-hours of *your* equipment.

BW SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER
1305 Eighteenth Ave., Rockford, Ill., U.S.A.
Export Sales Borg-Warner International — 35 So. Wabash, Chicago 3, Ill.

CLUTCHES



Gas Turbine Develops 3,250 Hp.

The single-shaft unit has a split casing, employing a simple open-cycle, the gas turbine operates at 8,500 r.p.m. Any output speed can be obtained through the use of gears for driving pumps and compressors. A quick-starting feature permits the gas-turbine power plant to reach operating speed in less than 3 minutes, the maker reports.

At full load, the exhaust flow is about 191,000 lb. per hour at 775° F. This relatively high exhaust temperature can be used to produce low-pressure steam with a waste-heat boiler or a heat exchanger located at the exhaust duct.

The gas turbine is 21 ft. long, 6 ft. wide, and 4½ ft. high. It weighs 14,000 lb. Its small size and weight permit installation in a limited area.

Mounted on a common bedplate, the unitized structure consists of a gas turbine, driven apparatus, starting-equipment auxiliaries, and controls. All integral piping and controls are included in one assembly.

Only the external utility connections are required before the plant is ready for operation. The total weight of the plant is 27,600 lb.

A minimum of operating personnel is required due to fully automatic protection and semiautomatic starting and stopping controls, according to the maker. The system is so arranged as to be adapted to remote control.

The gas turbine incorporates simplified two-bearing construction. **Write or call: Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, for details on 3,250-hp. gas turbine.**

●

Automatic System Cuts Corrosion

Called Capac, the system's applications include offshore rigs, radar towers, ships, and pipelines carrying sea water for cooling purposes to refineries.

The system is an impressed-current cathodic-protection type. It has no "sacrificial" parts to replace. A reverse current emanates from platinum anodes attached to the rig or pipeline at strategic points but insulated from it.

A silver chloride reference cell monitors electrical conditions. This cell guides an automatic controller which supplies the proper reverse voltage to the anodes.

Each anode is a circular platinum disk with a diameter of about 7 in. and 0.005 in. thick. These anodes mount in a polyester-plastic holder. **Write or call: Charles Engelhard, Inc., 850 Passaic Avenue, East Newark, N.J., for details on Capac.**

Pumping-Unit Counterbalance Is Adjustable

Providing a polished-rod API rating of 10,000 lb., the Model 10 pumping unit comes in four types and is available with counterweight cranks and beam counterbalance.

Two reducer sizes are available—40,000 to 57,000 in.-lb. API peak torque. The cranks on both are floor

clearing. A herringbone-gear type, the two reducers have a positive bearing-lubrication system.

Equipped with bronze saddle bearings and roller equalizer bearings designed for over 100,000 hours B-10 life, the pumping unit also features a swing-back arc type of hanger with vertical adjustment, heavy cast-iron slide rails, hydraulically ejected wrist pin, and a powerful band type of brake. **Write or call: Aztec Manufacturing Co., P. O. Box 11427, Fort Worth, for details on Model 10 pumping unit.**

●

Focusing Device Ups Log Accuracy

The new guard type of focusing device incorporates several new and unusual features which improve the accuracy and reliability of focus logging, the maker reports. It maintains a horizontal thin beam of constant current through the formation under a wide variation of borehole conditions.

If and when the resistivity range of the tool is exceeded, another curve is provided which records the correction factor to be applied for accurate true-resistivity determinations. According to the maker, the tool's greatest value is in logging: (1) thin broken sections, and (2) boreholes containing salty or low-resistivity mud. **Write or call: Perforating Guns Atlas Corp., Box 14524, Houston 21, for details on guard-type focusing device.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of December 9, 1957

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

SHOWCASE . . .

New Literature

Chemical Feeders Catalog describes and pictures a line of metering pumps. The 36-page file-size booklet reviews every class of pump. It details construction, displacement, and operating pressures, and lists recommendations for the feeders' use in handling specific chemicals, acids, and other liquids. The catalog is illustrated with photographs, cutaway drawings, and technical data. Handy volumetric conversion tables and a listing of pump components and accessories are also given. **Write or call: Manzel Div., Houdaille Industries, Inc., 315 Babcock Street, Buffalo 10, N. Y., for catalog on chemical feeders.**

●

Basic Requirements for a Proposed Offshore Platform which will operate in waters up to 600 ft.—or six times deeper than presently possible—are illustrated in a new 16-page brochure. A total of 11 photographs and drawings illustrate the brochure, which actually is a reproduction of a paper delivered before the petroleum division of ASME. **Write or call: R. G. LeTourneau, Inc., 2399 South MacArthur, Longview, Tex., for brochure "Mobile and Fixed Platforms for Waters Up to 600 Feet."**

●

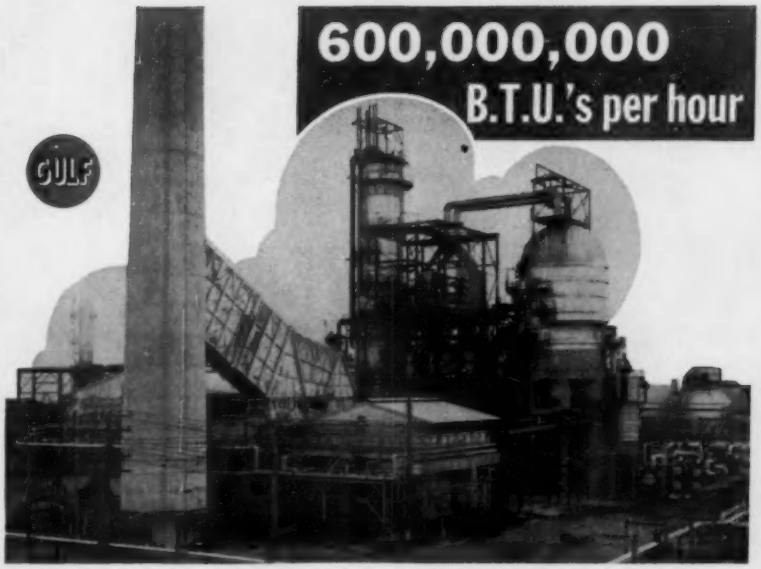
Magnetic Liquid-Level Gage. Two-page Data Unit 306 illustrates and describes the operation and gives technical data on the new Jerguson magnetic gage. This gage is said to make possible safe, accurate gaging of explosive or inflammable liquids. **Write or call: Jerguson Gage & Valve Co., 80 Adams Street, Burlington, Mass., for Data Unit 306.**

●

Barrel-Lift, Model 80, for raising, transporting, rotating, tilting, and draining a fully loaded 55-gal. steel drum is described in a new catalog. Model 85 drum carrier is also described and illustrated. The catalog demonstrates methods of moving and hoisting 55-gal. drums via monorail and crane. **Write or call: Morse Manufacturing Co., 727 West Manlius Street, East Syracuse, N. Y., for Bulletin 6-57.**

●

Temperature Measuring Instruments are detailed in a new four-page instruments folder. Two types are listed. One is an integral-probe type. The electrical indicating instrument



Forty-eight NATIONAL AIROIL Tandem Units fire Gulf's huge Crude Heater at Philadelphia.

with NATIONAL AIROIL'S *Exclusive* TANDEM COMBUSTION UNITS

This tremendous Combination Atmospheric—Vacuum Crude Heater at Gulf Oil Corporation's Philadelphia Refinery, was constructed by Foster Wheeler Corporation . . . for a total burner liberation of up to 600,000,000 B.T.U.'s per hour.

NATIONAL AIROIL *exclusive* Tandem Combustion Units achieve this capacity with maximum economy and availability.

These NATIONAL AIROIL oil burners are *all-alloy* for burning high temperature pitch separately, or in conjunction with non-aerated gas burners. Additional burners are also provided for waste gas disposal.

NATIONAL AIROIL Tandem Units are recognized as standard firing equipment in oil refinery and chemical plant heaters throughout the world. They are noted for versatility regarding fuels; and insure correct flame placement so necessary to avoid damage to the heat-absorbing tubes. Your furnace maintenance problems are measurably reduced, and hours on stream greatly increased by use of Tandem Combustion Units.

Further information sent upon request on your letterhead.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes; STEAM ATOMIZING OIL BURNERS; MOTOR-DRIVEN ROTARY OIL BURNERS; MECHANICAL PRESSURE ATOMIZING OIL BURNERS; LOW AIR PRESSURE OIL BURNERS; GAS BURNERS; COMBINATION GAS and OIL BURNERS; AUTOMATIC OIL BURNERS, for small process furnaces and heating plants; FUEL OIL HEATERS; FUEL OIL PUMPING and HEATING UNITS; FURNACE RELIEF DOORS; AIR INTAKE DOORS; OBSERVATION PORTS; SPECIAL REFRACTORY SHAPES.

CHEMICAL PETROLEUM DIVISION

NATIONAL AIROIL BURNER CO., INC.

MAIN OFFICE AND FACTORY:
1236 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.
Southwestern Division: 2512 South Boulevard, Houston 6, Texas

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

LEE C. MOORE
DRILLING STRUCTURES

DESIGNED
FOR THE JOB

LEE C. MOORE design engineers maintain constant study and research to provide the world-wide drilling industry with structures best suited to specific requirements.

Single Trailer Masts | Dual Trailer Masts | Portable Cantilever Masts | Super [illegible]

LEE C.
Moore
CORPORATION

TULSA · HOUSTON · NEW ORLEANS · CENTRALIA · OBERLIN
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mounts directly on a rigid probe. The other is a remote-probe type. The indicating instrument mounts in a convenient anodized aluminum case. The probe is located at the end of a flexible cable. Data on accuracy, response, and range of various scales available is included. **Write or call: Royco Instruments, 722 Arthur Street, Albany, Calif., for metal-probe thermometers folder.**

●

Regulator-Valve Sizing Charts illustrate a new four-page Bulletin J-SC showing how to size OPW-Jordan sliding-gate regulator valves. Technical data (applying to all makes of valves) tells how to adjust sizing for variations in pressure, temperature, viscosity, specific gravity, etc. Charts cover steam, liquid, and gas services. A cross-reference method of compiling the data eliminates the need to use rulers or slide rules. **Write or call: Jordan Corp., 6013 Wiehe Road, Cincinnati 13, for Bulletin J-SC.**

●

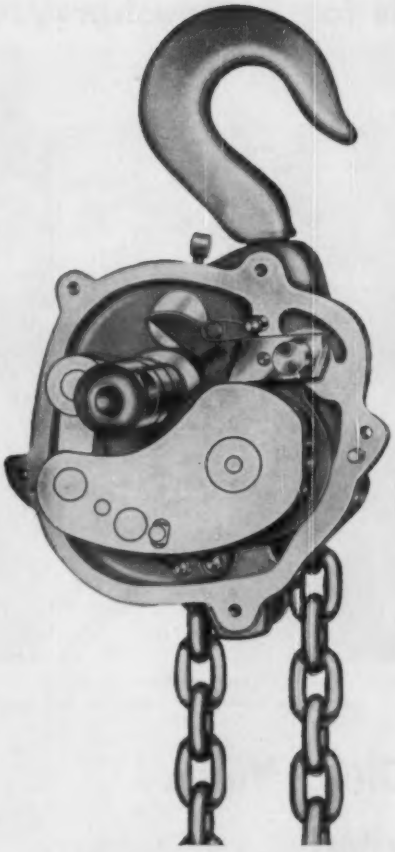
Tubing Swabs and Accessories. This eight-page Catalog 175 contains information on Bell Models 50, 10, and 20 tubing swabs and standard reversible cups, undersize reversible cups, and all rubber multirib cups. Accessories include overload relief valves, block-type packing rubbers for split-type oil savers, rope sockets, and ball-bearing swivel sinker-bar connections. A useful table on swabs and cups for tubing and drill pipe is included in the catalog. **Write or call: Bell Rubber Co., 5601 West Jefferson, P. O. Box 4426, Dallas 8, for Catalog 175.**

●

Filter-Separator four-page folder contains detailed information on the removal of all traceable dirt and entrained water in light fuels, solvents, distillates, and light petroleum liquids. The literature outlines the filter-separator's use in "dry cleaning" domestic fuel oils. Complete specifications and dimensional drawings are included. **Write or call: Bowser, Inc., 1300 East Creighton Avenue, Fort Wayne, for Fig. 842 filter-separator folder**

●

Shunt-Wound Direct-Current Drilling Motor (GE 752H) is presented in a new four-page bulletin. The motor is designed and insulated for operation from an engine-driven or electric-motor-driven generator. It is used for drilling rigs to drive the draw works, mud pumps, rotary table, etc. Four-pole and separately excited shunt



New

Compound

Levers

Make Coffing Super Powers the most efficient hoists in their class

Super Power hoists are designed around a new compound leverage principle. The levers, which replace the gears of conventional designs, enable workmen to raise loads with less handle pull than other hoists of the same capacities. Since use of the levers also reduces hoist size and weight, the workmen have 20% less weight to carry to the job.

Available in 1½ and 3 ton capacities in aluminum, and 1½ to 5 tons in malleable iron, Super Powers require little maintenance, since moving parts have sealed-in lubrication. Overload testing, "Safety Valve" handles, and constant load-locking ratchet and pawl assure safe operation. For complete details on these hoists, consult your favorite supply store or write to us for Bulletin L-3.

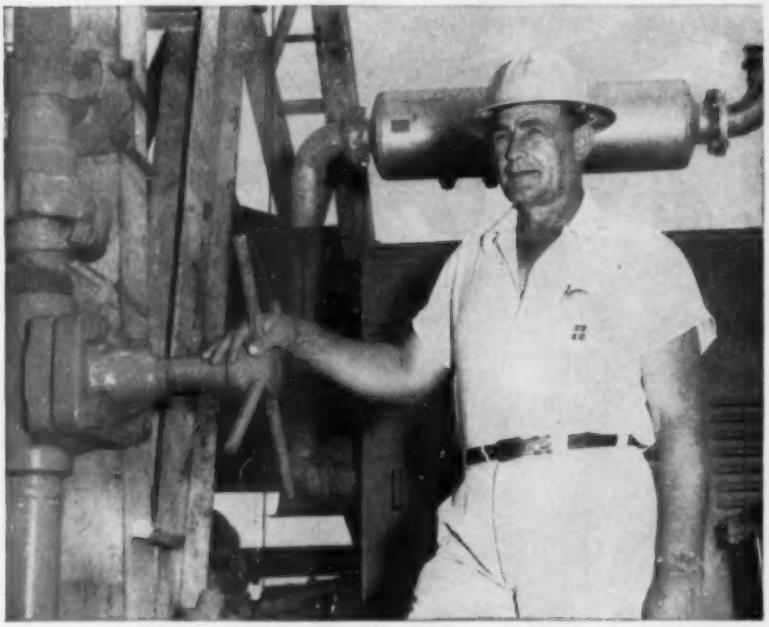
DUFF-NORTON **Coffing Hoist**

DIVISION OF **DUFF-NORTON COMPANY**

818 WALTER STREET DANVILLE, ILLINOIS

Ratchet Jacks, Screw Jacks, Hydraulic Jacks, Special Worm Gear Jacks, Ratchet Hoists, Electric Hoists, Load Binders, Spur Gear Hoists

Tips on Mud Valves for Toolpushers . . .



"Woodie" Farris, veteran toolpusher, finds MUDWONDER Valves superior to others he has used

Non-clogging MUDWONDER Valves are real oil field favorites!

by Woodrow Farris, Toolpusher, Rig #3
Kilroy Drilling Company, Alvin, Texas

NEARLY five years ago, I was pushing tools on a Gulf Coast rig. Some of the first test models of the MUDWONDER were installed on it. At first they seemed like just another mud valve . . . but then I noticed the MUDWONDERs simply didn't "sand up" like other types. Began to keep an eye on those Rockwell-built MUDWONDERs . . . and, by golly, they really stood out!

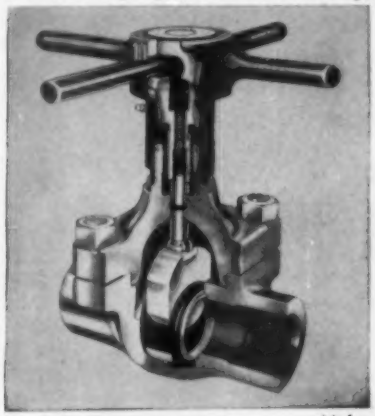
After the second or third hole, we knew we *had* something. The new MUDWONDERs just didn't clog. Even under worst conditions there was never more than a teaspoon of sand in the bonnet—and even this usually flushed free in the flow of mud.

There was no shut-down for cleaning. When essential, repairs could be made without down-time. The one-piece MUDWONDER body stayed right in the line. Rig personnel really *liked* the MUDWONDERs . . . said they were the cleanest and easiest to operate of any mud valves we'd ever used. Yet they cost us no more than ordinary mud valves.

Now, when Kilroy Drilling Company bought our present Rig #3, it was second-hand but almost new. There were a few MUDWONDERs already on it. But on the strength of our experience, Mr. John Baker, Drilling Superintendent, and I both were convinced we wanted MUDWONDERs all the way around. So we re-rigged the whole mudline system that way. Good thing, too. In a year of continuous operation, we've spent virtually nothing on repairs and have had a minimum of maintenance.

MUDWONDER Valves are built in 2", 3" and 4" sizes with screwed or flanged ends for 2000 psi WP (4000 psi test) and 3000 psi WP (6000 psi test). See your favorite oil field supply store, or write Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Company, East Chicago, Indiana.

MUDWONDER cutaway view shows the double thread construction, separated stainless stem and hard chromed gate with "T" slot connection, and the one-piece seat insert with the buna-N molded integrally over the steel wear-rings.



(Advertisement)

wound, the commutating-pole motor will not run in case of load loss, according to the maker, so it requires no speed-limiting control devices. The bulletin includes a graph showing the motor characteristics and application limits for oil well drilling service. An outline of the dimensions is also provided. **Write or call: General Electric Co., Schenectady 5, for Bulletin GEA-6691.**

●

Tank and Steel Fabricated Products produced by Buehler Tank & Welding Works are detailed in a new 16-page brochure. The publication lists sizes and specifications of such products as LPG tanks, NH_3 tanks, underground-storage tanks, tank heads, and others. Improved plant facilities of the new Orange, Calif., location are described. **Write or call: Buehler Tank & Welding Works, 321 West Vista, Orange, Calif., for products-facilities brochure.**

●

Welding-Equipment Catalog shows the range of products handled and describes a number of services offered by the company. Electric and gas-welding equipment and electric and pneumatic tools are illustrated in the 76-page catalog. Also included is equipment for pipeline construction, building fabrication, and many other industrial applications. **Write or call: Big 3 Welding Equipment Co., P. O. Box 3047, Houston 1, for product catalog.**

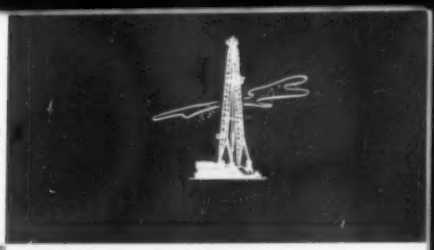
●

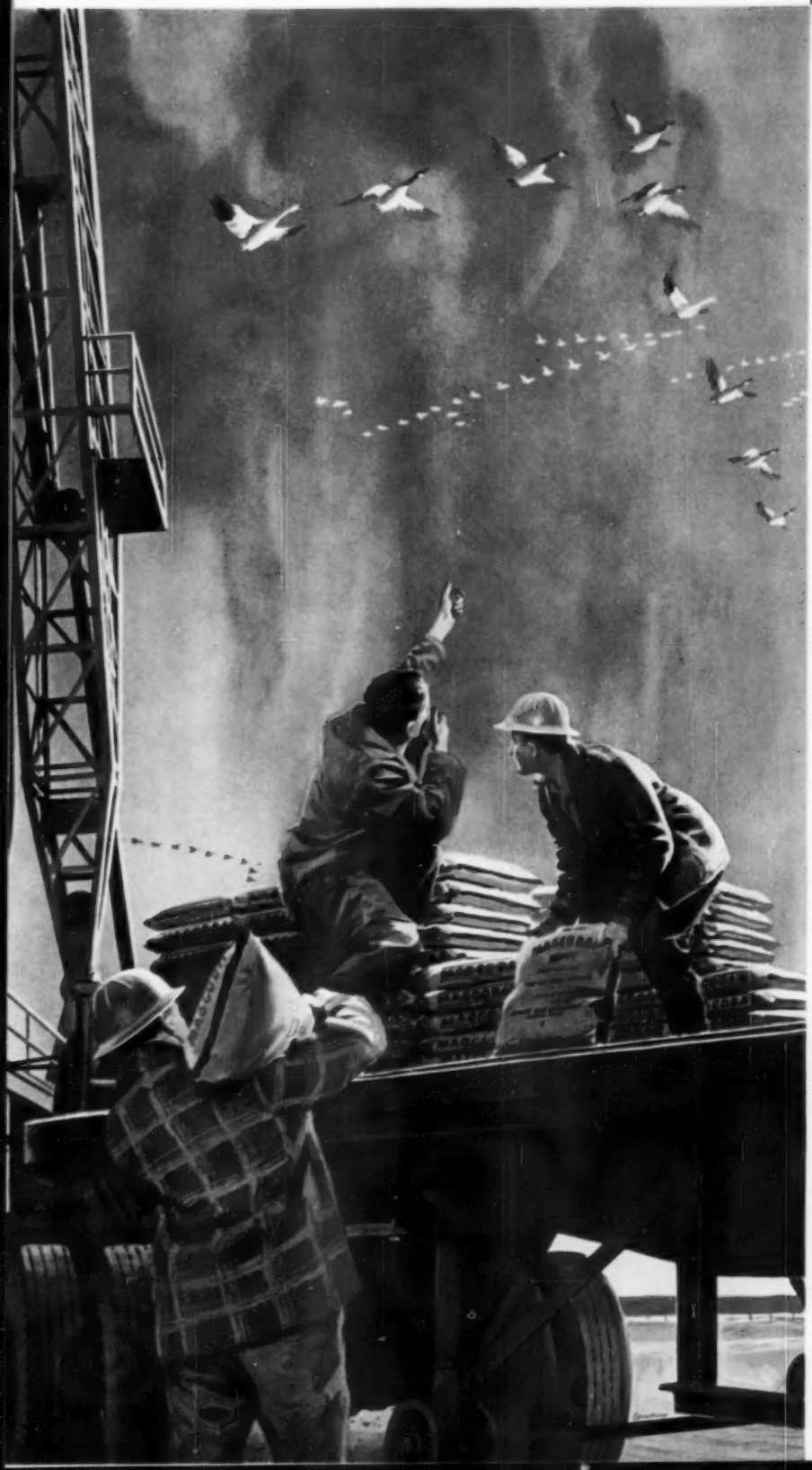
The Use of Automatic Equipment to obtain quality control in the lining of oil-field tubing is detailed in a new four-page report. The report follows the processing method through each step of the system, and shows how the Autotronic lining method eliminates the possibility of errors and carelessness due to the human factors, according to the maker. **Write or call: Tubular Lining Corp., P. O. Box 20015, Houston 25, for "Quality Control" report.**

●

All-Steel Ladder-Stand Catalog is now available. The new eight-page illustrated catalog gives complete specifications for a new line of ladder-stands. These stands move on special ball-bearing casters which retract automatically under weight. Height, platform size, depth, and over-all height for 30 models from one to eight steps are listed. **Write or call: Aluminum Ladder Co., Dept. 45, Worthington, Pa., for safety ladder stand catalog.**

With Magcobar on your well ..





you get dependable service from more than 475 dealer stock points

Dependable service means that you get the materials you want at your well when you want them. It means that your Magcobar dealer has everything in his warehouse to meet any mud problems that may arise. Magcobar's own strategically located warehouses back up the dealers in case of unusual or abnormal demand.

So much can depend on a sound mud program, and so much then depends on your having the right materials delivered on time. Because your Magcobar dealer realizes his heavy responsibility—that you can lose a well if he isn't on the job—he is ready to serve you 24 hours a day. Many Magcobar dealers use radio-equipped trucks to speed drilling mud chemicals to you in the shortest possible time.

Your Magcobar dealer is a local business man with a stake in the prosperity of his area and of his business. That's why he has a stake in your well. That's why he is prepared to give you his best.

Magnet Cove Barium Corporation
Houston, Texas

Magcobar®
Complete
DRILLING MUD SERVICE

58—100

C. E. Williams, Gulf Sales Engineer, Midland, Texas, and G. W. Ramsey, Assistant Plant Superintendent, inspect force feed lubricators on one of the modern gas engines at the Goldsmith plant of El Paso Natural Gas Company.

No lubrication problems in 8 years of operation

Since 1949, twenty-seven gas engine-compressor units developing 39,985 horsepower at the Goldsmith plant of El Paso Natural Gas Company have been thriving on Gulf Security Oil. Bearing, ring and cylinder wear maintenance records have been excellent.

Insure safe, more effective lubrication protection for *your* compressor units. Specify Gulf Security . . . the high quality, straight mineral oil. For full information, call your nearest Gulf office.

GULF®

GULF OIL CORPORATION, Dept. DM, Gulf Building, Pittsburgh 30, Pa.

Tretolite Co. Announces Transfers, Additions

Lloyd G. Heape, field engineer at Carmi, Ill., has been assigned to special corrosion work. Dwain R. Brown, previously with Cities Service Oil Co., has taken over Heape's other field duties.

James S. Martin has joined the firm as field engineer at Hobbs, N. M., replacing Kenneth Little who is being transferred to San Antonio, Tex. Martin previously was with Lane-Wells Co. at Farmington, N. M.

Bobby G. Little, field engineer at McCamey, Tex., has been transferred to Cortez, Colo., as representative in the Four Corners area. He has been replaced at McCamey by Howard McWhorter who joined Tretolite this year.

Warren E. Moore has joined Tretolite as corrosion engineer at Bossier City, La., and will cover the East Texas and North Louisiana area. He succeeds James W. Hakeman, formerly senior corrosion engineer at Shreveport. Hakeman recently was named assistant to the Rocky Mountain division manager, L. C. Dessert, Jr., and has located at Edmonton, Alta., Canada.

Bradford Motor Co. Names Stuart E. Corry . .

S. E. CORRY

general sales manager. According to George Morris, president, Corry, former sales manager for Franks Division, Cabot Shops, Inc., will head quarter in Bradford's Tulsa plant.

Drilling Fluids Corp. Will Furnish Mud Additives . .

KEN JENNINGS

to the Gulf Coast and Southwest areas. The new firm, just opening operations from Houston headquarters, will enter the manufacturing field as well as sales and engineering service. The company has a high-capacity plant already in operation. Authorized to do business in eleven states, a full staff of technical and engineering personnel is already employed.

President of the company is Ken Jennings. In addition to Jennings the board of directors includes: Glenn C. Wahlstrom, Houston; W. R. Hollis, Hobbs, N. M.; A. C. Allyn, Chicago; Gordon Scherck, St. Louis, Mo.; Franklin Bickmore, Chicago; and LeRoy Hines, San Francisco.

G. WAHLSTROM

GEORGE GRAY

Wahlstrom is general manager and vice president, and Hollis is secretary-treasurer of the firm.

Other appointments announced were: George R. Gray, vice president and manager of research and engineering; Charles Perricone, technical services supervisor; J. H. Dunaway, Louisiana area manager; Robert D. Blaicher, West Texas area manager; William K. Kristynik, purchasing agent; James A. Mahalec, controller; and Derwyn Jennings, sales in the Houston area.

Several distributors already have been approved for handling Drilling Fluids products, including: Terminal Mud Co., Midland, Tex.; Runnels Mud Co., Lovington, N. M.; and Mid-West Mud Co., Four Corners area.

Prior to forming the new company, Ken Jennings had served as a mud engineer in South America, as drilling and production engineer in Arkansas, Louisiana and New Mexico. In 1953 he organized the Jennings Drilling Co. Wahlstrom was an executive in

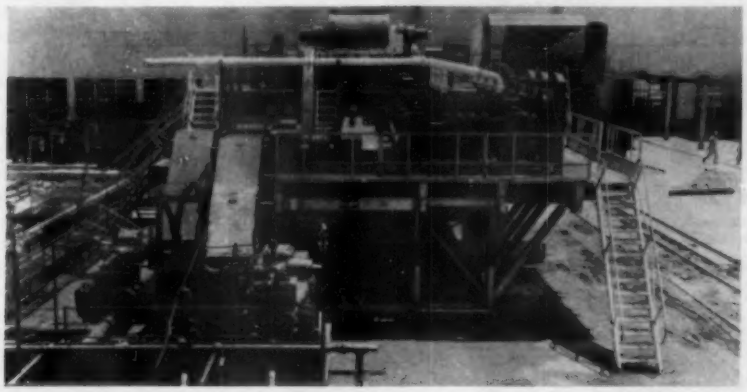
National Supply Co. Develops Rig-Up Business . .

although its Houston plant's principal activity is the manufacture of wellhead equipment. Rigup service is performed primarily for rigs to be shipped overseas through the Port of Houston. The plant is in the ship channel turning basin area, only a mile from deep-water navigation.

Components of the rigs are shipped from manufacturers in various parts of the country, including National Supply's machinery plants at Torrance, Calif., and Toledo, Ohio. The Houston plant fabricates portions of the system used to circulate drilling mud, including the mud tanks.

During a rigup, every component is put in position exactly as it will be used in drilling. At the end of this job, which takes 2 to 3 weeks, the rig is operated for a short time, then is disassembled into sections suitable for shipping. Because of the work done at Houston, the rigup by the drilling crew in the field can be completed in a few days.

National Supply built its Houston plant in 1935. It is located on a 14-acre tract and has manufacturing facilities, an office building, the company's Houston store and three warehouses. George S. Leonard is works manager, and Claude R. Neilon is chief engineer. James L. Payne is production supervisor, and John W. Adcock is rigup supervisor.



Closeup of a drilling rig for Kuwait as it was rigged-up at National Supply Co.'s Houston plant.

the Mid-Continent division and in the Houston office of Baroid Division, National Lead Co., before joining the new firm. Hollis was a partner

R. D. BLAICHER

J. H. DUNAWAY

in Jennings Drilling Co., and Gray had been chief drilling mud engineer with Baroid before joining Drilling Fluids.

Perricone had been a research section leader for a major mud firm and Dunaway had been a district superintendent for a major mud firm in Louisiana before joining Drilling Fluids. Blaicher had been an area engineer and sales representative working with drilling muds before joining Drilling Fluids. Kristynik has assisted mud distributors in the United States, Canada and Venezuela, and Mahalec had been staff assistant to the controller of Schlumberger Well Surveying Corp. Derwyn Jennings had been a field engineer for Dow Chemical Co. and an engineer for Baroid until joining the new firm.

Fischer & Porter Co. Occupies New Offices . .

adjoining its Hatboro, Pa., plant. The latest techniques were used in erecting the two-story, 50,000-sq.-ft. structure, among them the "lift-slab" method by which concrete floors and roof are cast on the ground and then raised into position by hydraulic jacks.

Cardwell Manufacturing Co. Names W. L. Chase . .

district sales representative for the Rocky Mountain area, headquartered in Casper, Wyo. According to Clyde Lackey, domestic sales manager, Chase for the last 3 years has been sales representative for Meredith G.M.C. trucks in Casper. Previously, he was district manager for Buda Engine Sales & Service for a 10-year period.

Axelson Manufacturing Co. Promotes G. W. Morte . .

to district manager of hydraulic sales and service for the Permian basin and Louisiana. He will coordinate sales and service activities of all personnel in his area. Previously Morte was district sales manager for Axelson, and prior to that was with Vickers Manufacturing Co. He will be located at the Axelson offices and hydraulic pumping unit center in Odessa, Tex.

HOMCO Transfers, Promotes

Houston Oil Field Material Co., Inc., has transferred B. J. Breeden from Oklahoma City to service sales representative, Houston; H. D. Dawson, from directional drilling, Ventura, Calif., to directional drilling, Maracaibo, Venezuela; William H. Dodson, Jr. from Lovington, N. M., to sales, Kimball, Neb.; William B. Hackett from maintenance to assistant manager of field maintenance, Houston; Jack B. Hallonquist, to assistant store manager, Liberty, Tex.; Jimmy R. Keyes from Houston to fishing tool expert, Marachaibo.

Moving from Houston to store manager, Pearsall, Tex., is A. R. King; C. L. Littlepage from warehouse manager to sales and service representative, Houston; C. L. (Hal) Roach from Rocky Mountain area manager to executive vice president, Oil Equipment, Ltd., Canada; Jerry G. Romine to store manager, Lovington; Rayford L. Sewell from Morgan City, La., to Brookhaven, Miss.; Dillard L. Thomas from Freer, Tex., to

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Slash Gas Scrubber Costs!

at Well Head and Natural Gasoline Plants!

Anderson's new method of scrubbing gas saves up to 500% over conventional methods. This unit, called Hi-eF line type purifier, occupies as little as 20% of the space of tank type scrubbers, yet recovers virtually 100% of the recoverable liquid present in butane, methane, propane and other hydrocarbon gases. Specify this thoroughly tested and proved design. Use it for all well head and natural gasoline plant applications. Mail coupon for full details.

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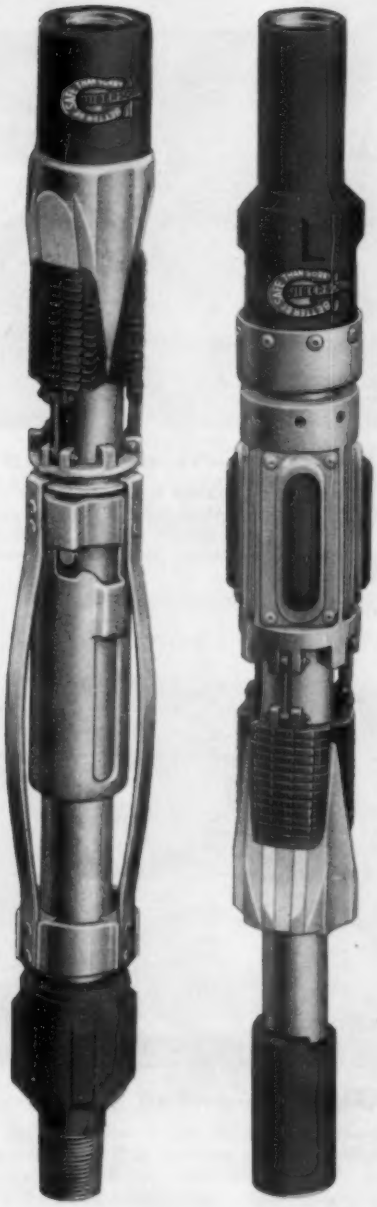
STOP TUBING MOTION *with a*

GUIBERSON TUBING ANCHOR



TYPE **AC** TYPE **AF**

You get three important savings when you support pump and tubing with a Guiberson Tubing Anchor — *save wear* on tubing, on collars and threads, on casing. When string is anchored, you'll have fewer leaks and the pumping operation will yield more fluid with less power. Guiberson gives you two types to choose from.

TYPE AF is a tension tool equipped with friction pads and automatic latch. It holds when tension is applied to string. A safety joint is incorporated in the bottom connection that lets you break loose if junk fouls the latch mechanism.

TYPE AC is equipped with jay-slot and friction springs. It holds when tubing is lowered. When unlatched and pulling, Type AC functions as a tubing catcher.

Both types made in a wide range of casing sizes and weights.

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DALLAS, TEXAS
- U. S. A.

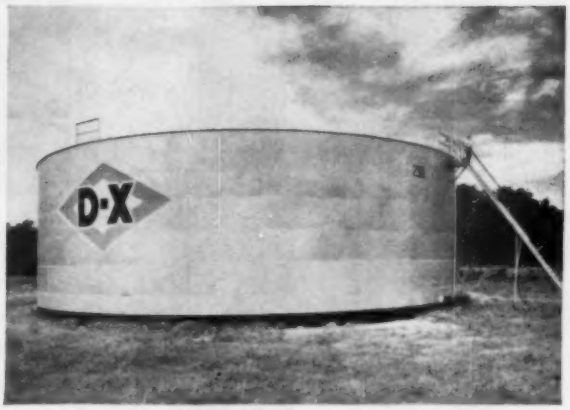
Sold by
Oil Field Supply Stores
Everywhere

How 4 big companies cut evaporation loss with "Microballoon"* spheres...

Savings up to

SOHIO—THREE YEARS

of savings have shown the effectiveness of this evaporation control method. The layer of "Microballoon" spheres in each tank on this five-tank farm is still intact. Four tanks have a 7-day cycle with 7 RVP oil. Fifth handles 4 to 5 RVP oil on 23-25-day cycle.

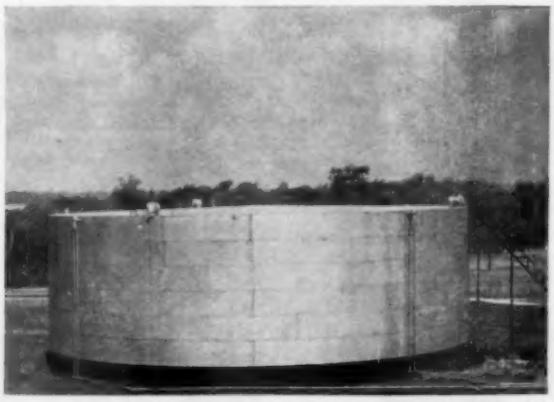


D-X SUNRAY—THREE YEARS

ago a layer of "Microballoon" spheres was installed in this 350,000 bbl. working storage tank. About 6,700,000 bbl. of select crude and mixed crude-casinghead gasoline have been pumped through, with vapor loss cut an estimated 70-80%. Tank is pumping or receiving 80% of the time.

COSDEN—THREE YEARS

after installing 4500 lbs. of "Microballoon" spheres in each of these tanks, an average of 1,500,000 bbl. have been pumped through per year. The foam seal is still at work, stopping evaporation an estimated 75%. Tanks handle sweet crude with high gravity—about 37° to 45° API. Gas content—40 to 50%.



SINCLAIR—THREE YEARS

of service in this cone-roofed tank have shown how much the layer of "Microballoon" spheres can save. A 50 per cent cut in evaporation loss is estimated, and other tanks at the site are due for the same treatment. Tank's average temperature is 75 deg. F., RVP is 5.6 psi.

*Registered trade-mark of The Standard Oil Co. (Ohio)

80%...year after year!

Evaporation loss was cut as much as an estimated 80 per cent for the cone-roofed tanks shown at left. For several years, these tanks have been equipped with a layer of "Microballoon" spheres. These microscopic hollow spheres of BAKELITE Brand Phenolic Resins form a blanket that floats on the surface of crude oil, preventing escape of costly volatiles.

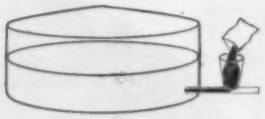
If you are seeking an inexpensive, convenient, quickly-installed method of controlling evaporation loss, these case histories prove that this is a good place to begin. Learn how "Microballoon" spheres made from BAKELITE Phenolic Resins can work for you. Write Dept. BB-128.

FOR EVAPORATION CONTROL

BAKELITE
BRAND
RESINS

UNION CARBIDE

HOW "MICROBALLOON" SPHERES WORK TO CUT EVAPORATION LOSS



1 **"Microballoon" Spheres are mixed with oil being pumped into the tank.**

2 **They immediately start floating to the oil surface, form a blanket in a few hours.**

3 **The blanket seals the entire surface within the tank. This surface seal cuts evaporation loss.**

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The terms BAKELITE and UNION CARBIDE are registered trade-marks of UCC.

sales, Kenedy, Tex.; C. J. Erwin from Louisiana division manager, services, to manager, export, New York City; and H. D. Robinson from resident sales manager, Tulsa, to assistant export manager, New York City.

New Facilities Opened by Vinson Supply Co. . .

at Houston, making the company's sixth permanent warehouse and office location. This joins existing stores in Amarillo, Dallas, Farmington, Odessa, and Tulsa, and sales offices in Kansas City, Mo., and Oklahoma City.

Vinson Supply was founded 32 years ago by Bailie W. Vinson, who continues as president and chairman of the board. J. M. McReynolds is vice chairman, and L. O. Barnett is executive vice president. These three headquarter at Tulsa. John H. Heinzerling, with Vinson 17 years, is vice president and manager of the Houston facilities.

Vinson Supply, an independent distributor of pipe, tubing, valves, and fittings, represents Crane Co., Ladish Co., and National Tube Division of U. S. Steel Corp., and Rockwell-Nordstrom.

Look to COOK for Better Packings!

Don't Let This Happen To Your Packing Glands!

NO doubt about it — using the wrong material for a packing gland in corrosive service is like locking a wildcat in a cardboard box. It will be chewed up in no time!

There's no need for rust and corrosion to raise havoc with your packing glands, regardless of how tough the service. In 999 cases out of 1000, packing glands made of Cook stainless steel or Cook *Ni-Resist* type iron will solve your problem, once and for all.

For the remaining 1 problem in 1000, Cook can probably *design* an answer. That's because C. Lee Cook pioneered in the field of metallic packings — knows more about their specific, on-the-job applications than anyone else.

Whether you manufacture original equipment or want to recondition old packing cases, always insist on genuine C. Lee Cook parts and service. Write for full details. C. Lee Cook Company, 934 South 8th Street, Louisville 3, Kentucky.

C. LEE COOK COMPANY

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Rings and Packings Since 1888

Shaffer Tool Works Forms New Corporation . .

J. T. MONKS, JR.

to facilitate Shaffer operations in the various oil and gas countries of the Western Hemisphere. The first division of the new corporation, to be known as Shaffer Western Hemisphere, Inc., will be a Canadian division for which ground has been broken in Edmonton, Alta., for construction of an office and warehouse building. John T. Monks, Jr., is manager of this new Canadian division.

According to Donald U. Shaffer, president of Shaffer Tool Works, it is anticipated that additional divisions of the new corporation will be formed for handling other Western Hemisphere activities.

B-I-F Industries, Inc., Names L. F. Kotula . .

as a sales engineer for its Chicago office. This Providence, R. I., firm manufactures meters, feeders and controls for industrial installations.

Kotula had been a staff engineer in charge of sales and estimating and a purchasing agent before joining B-I-F industries.

UOP Men Honored for Chicago Area Service . .

by Chicago Technical Societies Council. Dr. Herman S. Bloch (left) and Dr. Donald J. Bergman (right), both of Universal Oil Products Co., Des Plaines, Ill., receive awards of merit and congratulations from Alvin Blake, president of the council. This is the first time two members of the same company have received the awards.

Bloch, deputy director of refining research, was nominated for the honor by the American Institute of Chemists and the American Chemical Society. Bergnan, chief engineer of UOP, was sponsored by the American Society of Engineers.

Lane-Wells Co. Elects Two Vice Presidents . .

at a recent meeting of the board of directors. R. W. Keener and John H. Zauner are the recently elected officials.

According to J. J. Neale, president, Keener has served in service-company operations 16 years. One of the original partners of the Petro-Tech organization in Venezuela, he resigned as vice president of that company to return to the United States in 1955. Recently he has been coordinator of foreign sales-service for Lane-Wells.

Zauner, recently technical assistant to the president of Lane-Wells, was formerly operating staff assistant for

R. W. KEENER

J. H. ZAUNER

Dresser Industries, Inc., Dallas. He has held management-engineering positions in several companies in the United States and South America in the past 20 years. In addition to his duties as vice president, Zauner will be technical director in charge of all engineering and research activities for Lane-Wells.

Oil Well Supply Division Transfers Two . .

in its Canadian area. Angus F. Blunderfield, store manager, has moved from Okotoks, Alta., to Drayton Valley, Alta., according to W. A. Weir, Canadian area manager for this division of United States Steel Corp. George R. Day has been named field representative at Estevan, Sask.

Blunderfield joined Oilwell in 1952 at Okotoks, transferred to Calgary in 1956 and was appointed store manager at Okotoks early this year. Day was employed by Oilwell in 1956 at Estevan.

Wayne C. Rhoads Appointed By John A. Green Co. . .

as resident engineer responsible for sales activities in southern Texas. He will headquarter in the Southern States Life Insurance Building, Houston.

The Green company is sales-engineering representatives in Texas and Oklahoma for 20 nationally known manufacturers of electrical and electronic components and instruments. The company has other sales offices in Dallas, Tex., and Tulsa.

Before joining Green at its Dallas office, Rhoads was with Temco Aircraft, Hughes Aircraft and Convair.

Halliburton Executive Elected API Director . .

at the organization's annual meeting in Chicago. Grover Kilgore, Halliburton Oil Well Cementing Co.'s vice president for sales and advertising, who has been a member of the API's board of councilors for 5 years, currently is president of the Petroleum Equipment Suppliers Association, national organization of oil-field service and supply companies.

G. KILGORE

Secretary of the Interior Fred Seaton named Kilgore to the National Petroleum Council early this year. The council is a group of oil executives advising the government on petroleum production, refining and distribution.

Victaulic Co. of America Makes Sales Appointments

M. R. (Mike) Huffman has been named Mid-Continent sales manager headquartered at Tulsa, from which point he will also service the Oklahoma-Kansas area.

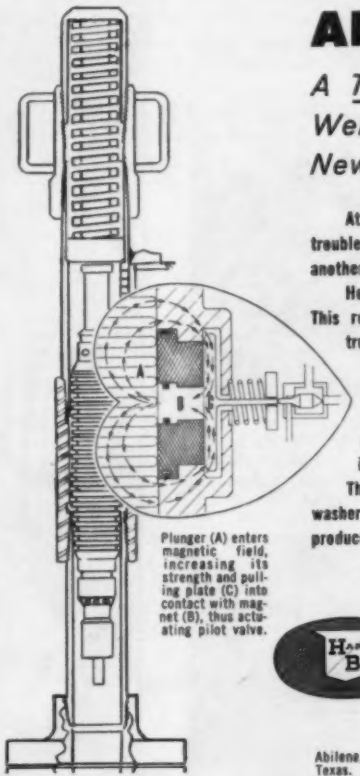
Succeeding Huffman in Odessa is Ray F. Smith, who has been covering the West Texas-New Mexico district since 1955. A new sales engineer, Allen H. Leibee, will assist Smith in the West Texas district. Leibee has had extensive experience with a major oil producer as well as with equipment manufacturers.

On the West Coast, Fred A. Anger has been employed to assist H. Dave Squibb, manager of Victaulic's Los Angeles branch. Anger formerly was assistant marketing manager with Howard Supply Co.

Darwin H. Clark Co. Buys Brennan Agency . .

of Houston. The organization will be known as Darwin H. Clark Co. of Texas.

J. Earl Brennan, of Brennan, McGary & Robinson, Inc., will remain with the firm as chairman of the



Plunger (A) enters magnetic field, increasing its strength and pulling plate (C) into contact with magnet (B), thus actuating pilot valve.

ANNOUNCING...

A Trouble-Free Oil and Gas Well Plunger Operation With New Magnetic Trip Lubricator

At last, the oil and gas industry has available a trouble-free well plunger-lubricator-controller system—another Harold Brown Company first.

Heart of this system is the magnetic trip lubricator. This revolutionary trip mechanism has no opening, protrusion or movable seals into the lubricator. Rather, a balanced magnetic circuit is interrupted by the plunger's entry into the lubricator. This triggers a pilot valve which closes the controller, shutting down the flow line motor valve instantly.

The magnetic trip, used with the Harold Brown wobble washer plunger and the Harold Brown B-1 controller, produces unprecedented efficiency.

For further details, get in touch with

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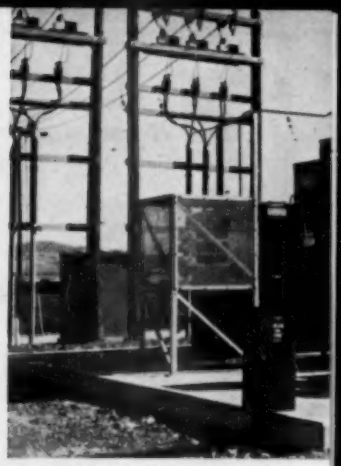
SALES AND SERVICE

Abilene, Beaumont, Corpus Christi, Midland, Alice, Wichita Falls, Texas. Lafayette, Houma, Shreveport, Louisiana. Farmington and Hobbs, New Mexico. Oklahoma City and Guymon, Oklahoma. Sterling, Colorado. Zanesville, Ohio. Mt. Pleasant, Michigan. Edmonton, Alberta, Canada and Mexico City, D. F.

BUILT IN 14 MONTHS by The M. W. Kellogg Co., new ammonia plant is a unit of Standard's Richmond refinery, one of West's largest. All electric equipment is by General Electric, which also provided engineering service to help achieve fast start-up.

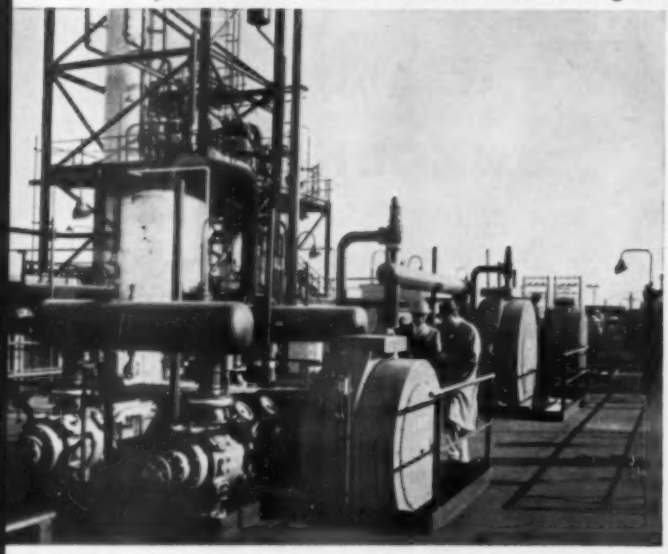


CO-ORDINATED for top reliability, G-E equipment in master substation for ammonia

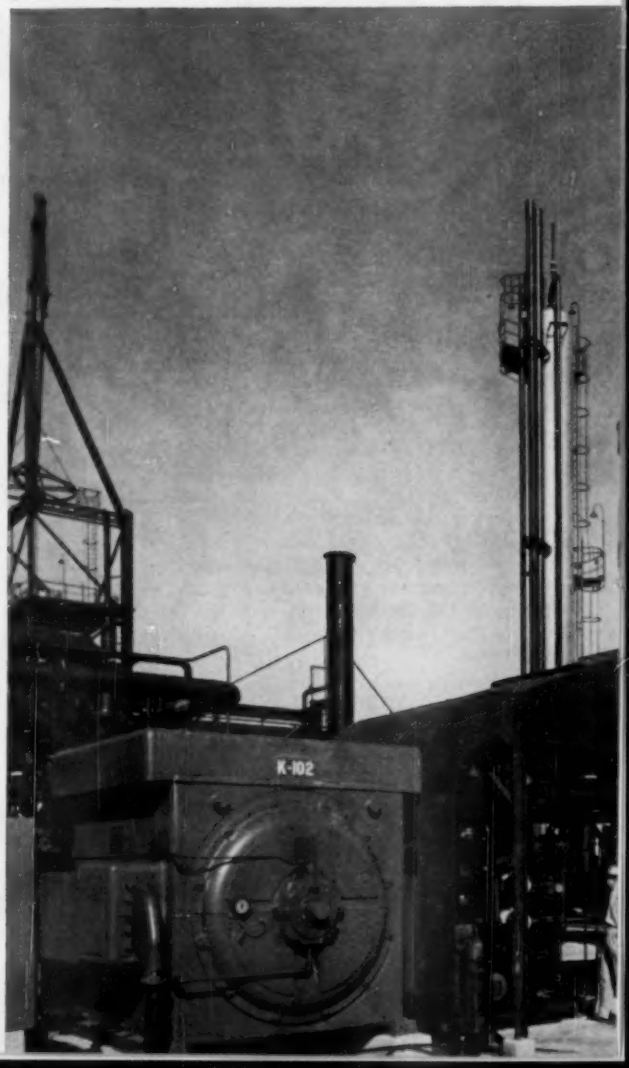
At Standard's Richmond, Calif., refinery . . .

General Electric engineering services help

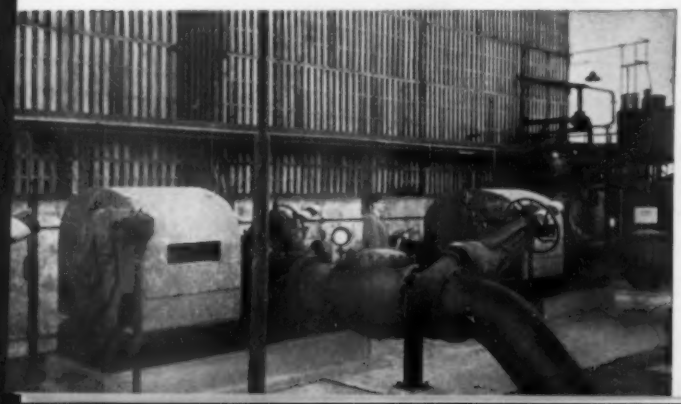
OUTDOOR-LOCATED on platform to drive compressors are 8 high-efficiency, enclosed, force-ventilated G-E synchronous motors (3 shown) with excitation obtained from substation's d-c m-g sets.

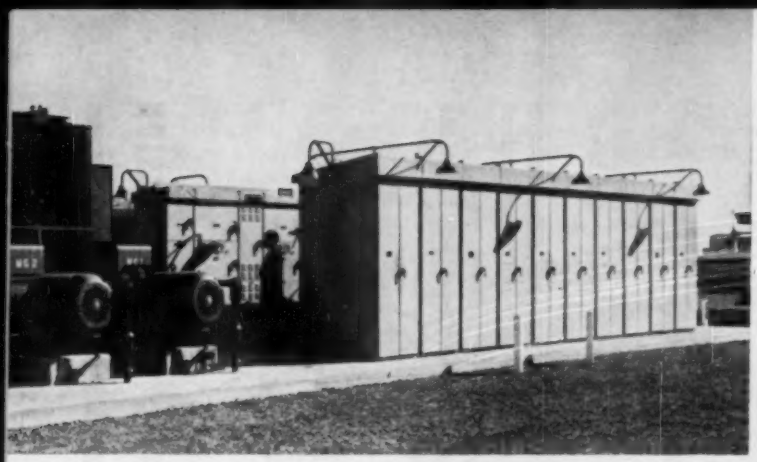


PLANT'S BIGGEST, a 4000-hp 12,000-v totally enclosed force-ventilated G-E induction motor drives synthesis gas compressor. Explosion-proof 60-hp G-E motor (r.) drives blower



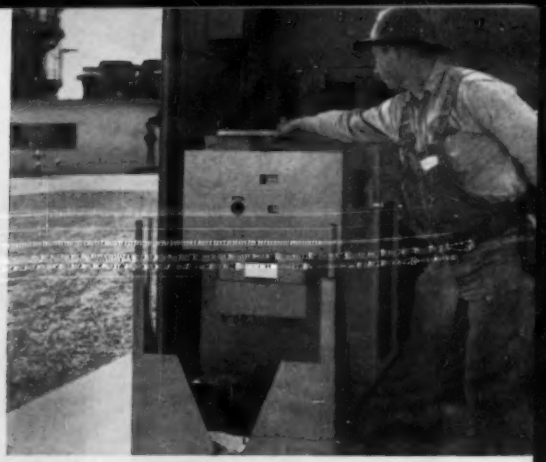
WEATHER-PROTECTED, 2 rugged 350-hp G-E induction motors drive cooling-water pumps. Other plant induction motors are either enclosed force-ventilated or explosion-proof, fan-cooled. ▼





plant includes 5000-kva transformer, 17 units of 12-kv metal-clad switchgear, 2300-v Limitamp* motor starters, 480-v outdoor motor control centers, 2 outdoor motor-generator sets, and two 480-v transformers.

*Registered trade-mark of General Electric Co.



EASY MAINTENANCE of plant's G-E metal-clad switchgear is shown by workman removing vertical-lift, magne-blast circuit breaker for inspection.

speed opening of 300-ton/day ammonia plant

drawing clean air—via black ductwork and mushroom tower—from upper level of uncontaminated atmosphere.

General Electric power system, installed to meet rigid construction schedule, helps plant get fast start on profitable production

Standard Oil Company of California, Western Operations, Inc., recently added to its Richmond, California refinery—the largest west of the Rockies—a new $11 million ammonia plant designed, engineered and built by The M. W. Kellogg Co. The plant's capacity of approximately 300 tons per day of anhydrous and aqueous ammonia is shipped to nearby California Spray Chemical Corp., a subsidiary, for conversion into fertilizer.

GENERAL ELECTRIC supplied the new plant's electric equipment—compressor drives, auxiliary motors, and complete outdoor substation with co-ordinated components. In addition, General Electric engineering services helped both customer and designer get the new plant from the discussion stage to on-stream in only 14 months.

An example was the contribution of General Electric installation and field service engineers. By supervising the installation of the electric equipment as scheduled deliveries arrived, they helped reduce field installation costs, speed completion of construction schedules, and hasten start-up time. To Standard, this meant getting into production faster, and thereby, showing a return sooner on the large capital investment tied up in the plant.

IN ADDITION, the 17,000-kva block of power will be integrated into the existing plant system. General Electric application engineering services, working closely with Standard and Kellogg representatives, helped provide the electrical equipment co-ordination and integration necessary to meet the plant's process power requirements.

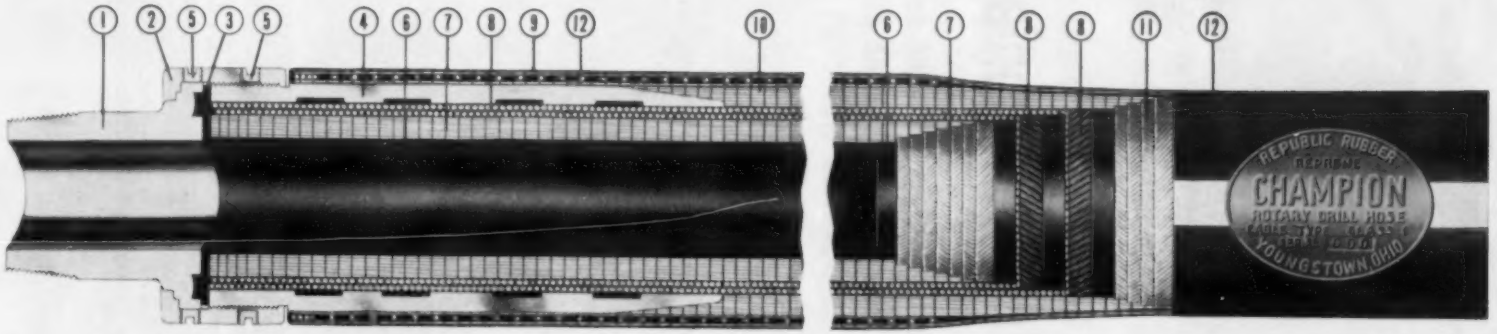
For *your* new chemical plant, too, General Electric offers a one-manufacturer source of quality electric equipment and valuable engineering services to help provide you and your process contractor with an efficient, co-ordinated electrical system. Early in your planning, contact your nearest General Electric Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y.

661-49

Engineered Electrical Systems for the Process Industries

GENERAL ELECTRIC

Here's the INSIDE STORY...



12 REASONS WHY REPUBLIC CABLE-TYPE ROTARY DRILLING HOSE IS SAFER AND LONGER LASTING

1. **Nipple Head** of tough alloy steel will give maximum service. Standard A.P.I. threads.
2. **Collar** firmly attached to couplings. Will stay put.
3. **Sealing Gasket** specially compounded. Seals pressure in.
4. **Republic Couplings** give you a hose with no weak spots. In ordinary rotary hose, reinforcing wires or cables are placed over the couplings. Spacing between wires must be widened since O.D. of hose and coupling combined is greater than hose itself. These gaps create a weak spot at a critical point. Republic's new coupling design keeps the wire cable snugly and evenly spaced against the hose all the way and underneath the couplings . . . giving uniform strength the entire length of the hose and still maintaining the important full-flow feature.

THERE IS NO WEAK POINT IN A REPUBLIC ROTARY HOSE.

5. **Set Screws** prevent loosening of collar and nipple head.
6. **Hot Oil & Abrasion-Resistant Reprene Tube** resists wear of corrosive drilling muds, withstands swelling and softening effect of oil.
7. **Multiple Fabric Plies** give greater resistance to pressure.
8. **Steel Cables** imbedded in rubber guarantee strength and reduce pulsation and vibration during pressure surges.
9. **Circumferentially-Wound Steel Cable** reinforces ends and prevents kinking at these critical spots.
10. **End Reinforcing Fabric Plies** work with the steel cables discussed in No. 9 to give even greater insurance against kinking and breaking at the vital hose ends.
11. **Additional Fabric Plies** give extra strength and permanently anchor reinforcing cables in place.
12. **Extra Tough Reprene Cover** will resist cutting, abrasion, and weathering. Oil resistant.

CLASS C

Each Length tested to 5,000 lbs.

THERE'S NO BETTER HOSE MADE!

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

board. Darwin Clark will be president, and James Gerrard, now vice president and Houston manager of the Clark operation, will be executive vice president. John McGary and Byron Robinson will be vice president and secretary and vice president and treasurer, respectively.

Robert A. Forsman Elected President of Win-Well . .

R. A. FORSMAN

according to an announcement made at a recent meeting of the board of directors.

Simultaneously, the Win-Well Manufacturing Co. headquarters will be moved from Los Angeles to Tulsa to accommodate expanding sales and distribution of the company's Multi-port rotary selector valve.

Forsman succeeds William B. Pollock, who has resigned due to other business considerations in California which would preclude his moving to Tulsa.

Forsman is well known in both the production and refining industries, with over 15 years' experience in sales management and technical sales and in construction, maintenance and mechanical engineering. Most recently engaged in independent producing operations, Forsman was formerly assistant chief engineer of the refining division of the old Deep Rock Oil Corp. Prior to his association with Deep Rock, he had been engaged in general engineering sales, after having served as assistant superintendent of compressor stations for Oklahoma Natural Gas Co. in 1946 and 1947.

Win-Well Manufacturing Co. was organized in 1956 when it bought the assets of its predecessor, Win-Well, Inc. The new 7-way valve was introduced to the oil industry at that time for application in manifolding production flow lines from wells, although many additional applications for the valve have been developed for both manual and automatic operation.

Fluor Subsidiary Moves Its Headquarters . .

to the Continental Life Building, Toronto. Fluor Corp. of Canada, Ltd., a wholly owned subsidiary of Fluor Corp., Ltd., Los Angeles, will have 4,200 sq. ft. of space with an additional 2,600 sq. ft. available for future expansion.

Fluor of Canada does engineering-construction work for the petroleum and chemical industries.

J. B. Beaird Enters Oil Industry in Canada . .

with an order for packaged compressor plants for Goliad, Ltd., and Texaco Exploration Co. to be installed in the Pembina field, Alberta. J. B. Beaird Co., Inc.'s Canadian affiliate, Beaird International, Inc., will supervise the project. The company will subcontract with Canadian firms for fabrication work, and engineering work will be carried out in the company's engineering department in Shreveport, La.

Brown & Root, Ltd., and Standard Iron & Engineering Works, Ltd., both in Edmonton, will assemble the units, assisted by Beaird production specialists located in Edmonton. Charles W. Haynes, Beaird engineer, has been appointed project manager for the Canadian order.

According to J. Pat Beaird, president, this subsidiary of American Machine & Foundry Co., plans to open a sales and service office in Calgary. AMF has a number of other subsidiaries in Canada, including AMF Atomics (Canada), Ltd., Leland Electric Canada, Ltd., DeWalt Canada, Ltd., and American Iron & Machine Works (Canada), Ltd.

Mission Manufacturing Co. Appoints Gerald Seber

GERALD SEBER

export sales representative with headquarters in Houston. According to Richard E. White, executive vice president and general manager, Seber joined Mission 1½ years ago as a field sales representative in the Ark-La-Tex district with offices in Shreveport. He held that post until his recent appointment.

M. M. & M. Appoints Product Managers . .

in the Consolidated Ashcroft Hancock division. Arthur W. Johnson has been named manager of Ashcroft gage products, and Jack E. Cox, manager of Consolidated safety valves, according to William H. Bolin, manager of product planning for this division of Manning, Maxwell & Moore, Inc.

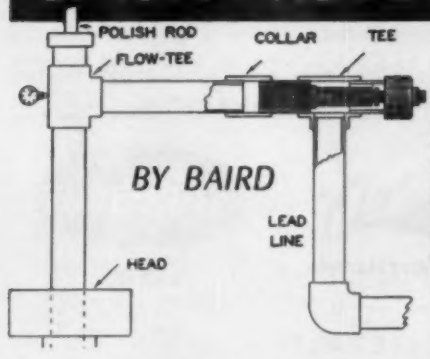
A. W. JOHNSON

J. E. COX

Johnson was with Bethlehem Steel Corp. prior to joining M. M. & M. in 1943. He has served as sales engineer

BACK-PRESSURE REGULATOR

"Wherever there's oil you'll find Baird products on the job."



Keeps pressure on tubing strings.

For wells that head up and flow, back pressure on the tubing tends to keep the tubing full which prevents stuffing box trouble and increases pump efficiency. By maintaining a back pressure on the tubing, this regulator keeps gas from breaking out of the solution and thus helps to prevent paraffin formation.

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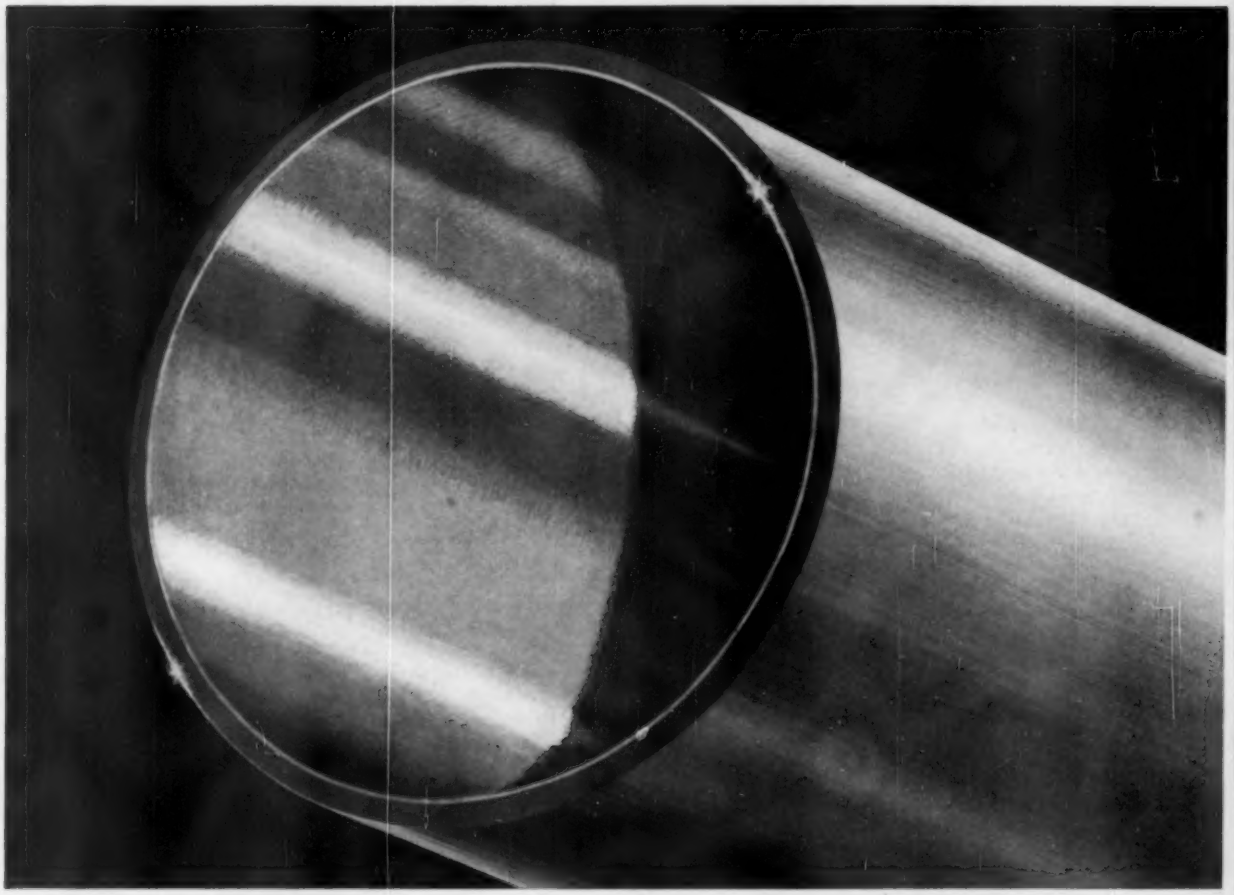

New plastic coated pipe is custom made for severe corrosion conditions

NOW—with Tube-Kote's tough, new TK-33 baked Polyurethane coating—Kaiser Aluminum offers you aluminum pipe with almost unlimited applications for oil field use.

Strong, durable Kaiser Aluminum pipe coated internally with flexible TK-33 is designed to resist the most severe corrosion. It has all the advantages of lightweight, easy handling aluminum in a pipe that permits the lowest possible installation cost for above ground piping systems. It's designed for salt water injection and disposal lines, sour crude oil flow lines, and many other applications where extreme internal corrosion can be a problem.

Look at the tested advantages of TK-33 Polyurethane coating.

- Excellent resistance to salt water, acid, caustic fluids, crude oil and other highly corrosive agents.
- Won't crack, craze or chip—high degree of flexibility allows TK-33 to move with the metal.
- High impact resistance . . . TK-33 passes 20% elongation at 14.8 ft./lbs. impact in G-E Impact-Flexibility Tester.
- Excellent abrasion resistance—tough coating stands up under the wear of friction.

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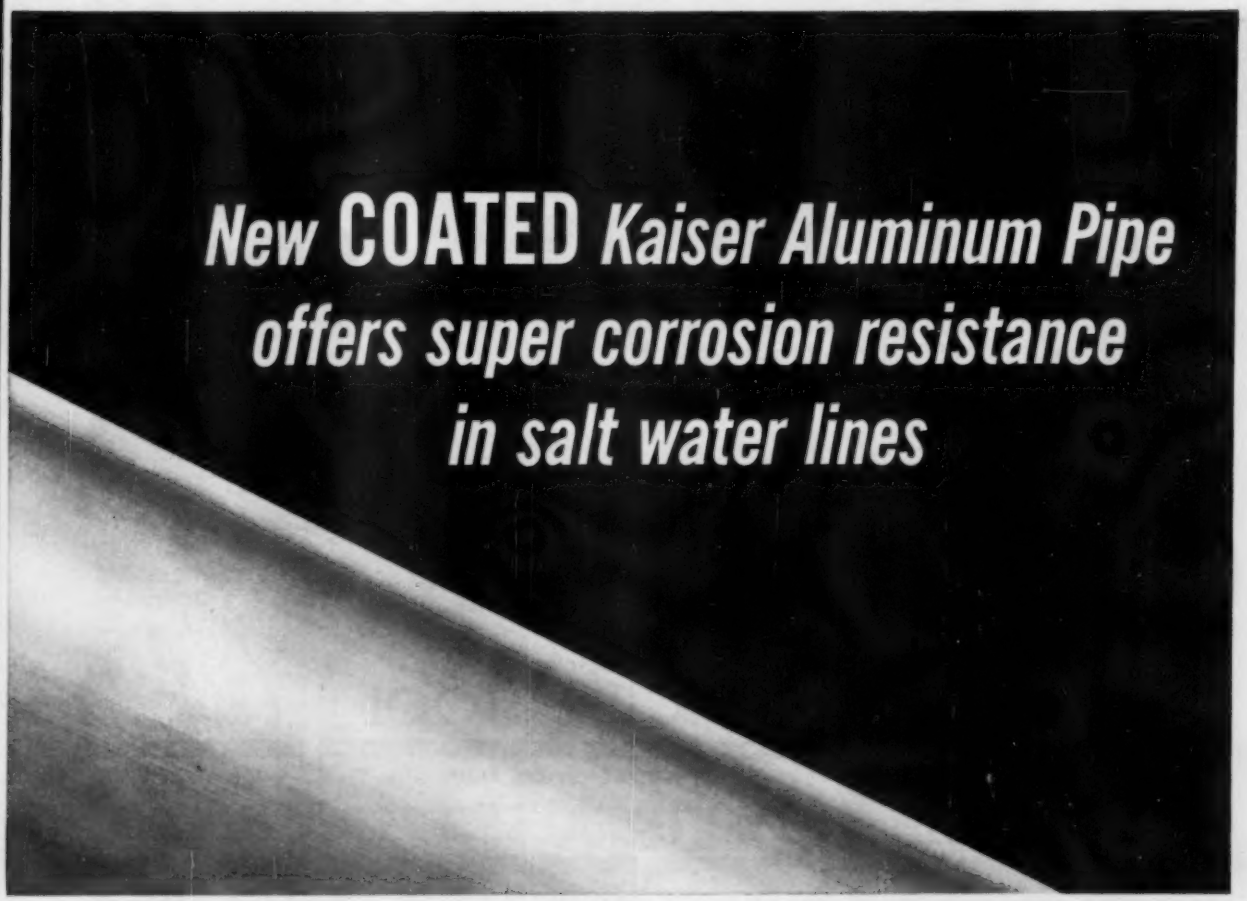
THE BRIGHT STAR OF METALS



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New TK-33 coated Kaiser Aluminum pipe, coated by Tube-Kote, is available through our distributors in a complete range of sizes in schedules 5, 10 and 40. Also available—fast delivery of standard corrosion resistant Kaiser Aluminum pipe in 20, 30 and 40-foot lengths in 2" diameter, 0.065" wall thickness; 2½", 3" and 4" diameter, 0.083" wall thickness. Other sizes subject to special inquiry.

For information contact any distributor shown below—or your local Kaiser Aluminum sales office. Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Ill.; *Executive Office*, Kaiser Bldg., Oakland 12, Calif.

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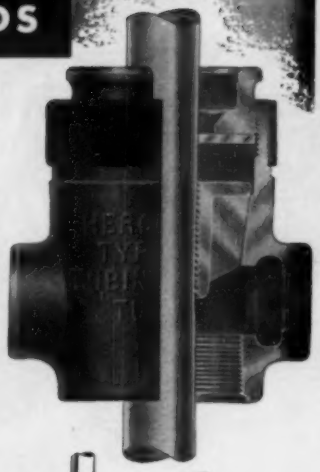
The dual purpose "Type J-5-S" Stripper Tubing Head is basically a "Type J-5" Tubing Head with a bowl (top section) screwed into the packing nut thread. The hinged slips, packing and packing nut are installed in the bowl (top section) with the tubing stripper in the body (lower section), thus permitting tubing to be run-in or removed under pressure. Test pressure is the same as the "Type J-5" Tubing Head.



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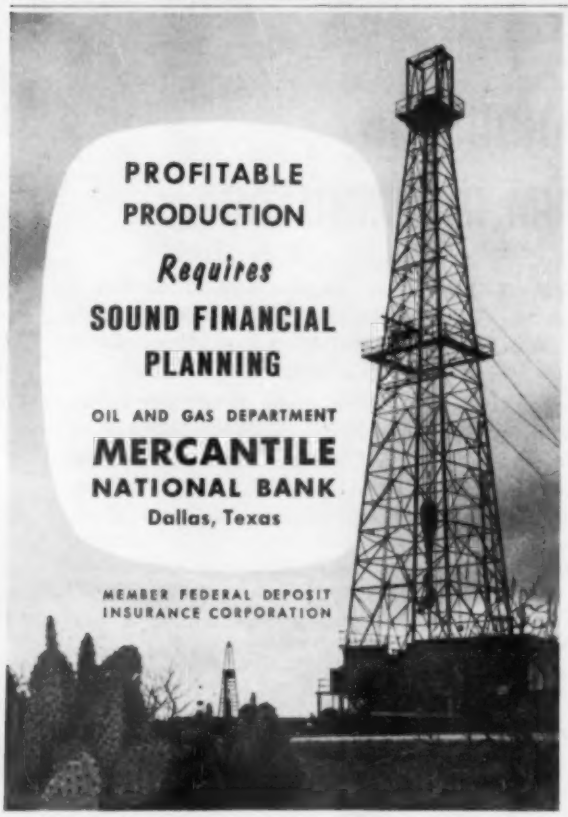

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Trucks, Drill Equipment, etc.

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AUCTIONEERS

covering the Pittsburgh area and later transferred to the New York territory in the same capacity. In 1956 he was promoted to product manager, Consolidated safety valves.

Cox, who succeeds Johnson, was recently sales engineer in the New York area. He joined the firm in 1948 as sales engineer in the Cincinnati territory. He was transferred to the New York area in 1955.

Lunkenheimer Co. Promotes Two Sales Personnel . .

LAMBERTSON

to expand the sales administrative force at the Cincinnati, Ohio, home office. George W. Lambertson, formerly Chicago branch manager, has been promoted to a divisional sales manager; and Jack W. Montgomery, sales representative at the Chicago office, succeeds Lambertson as branch manager.

In the expanded home office sales administrative force, Melvin W. Pauly,

H. EWELL RAINS

H. H. LAYRITZ

vice president in charge of sales, will be assisted by H. Ewell Rains, with Harold H. Layritz and Lambertson as divisional sales managers. Rains formerly was assistant to the vice president in charge of sales. Layritz has been with Lunkenheimer for the past 37 years in sales and advertising capacities. Montgomery has been a sales representative for the company 9 years.

Birdwell Forms Division, Opens Two Stations . .

in Texas and West Virginia. The newly formed Texas division will be headed by Robert Finney as Texas division manager. Robert Neal, formerly a logging engineer at Bradford, Pa., is station manager of Birdwell, Inc.'s new Monahans, Tex., station, while Richard Kennedy, former logging engineer at Parkersburg, W. Va., is station manager at the Charleston, W. Va., station.

Blaw-Knox Co. Promotes Wendell F. Simmons . .

to regional vice president in the New York - Philadelphia area. He will represent management in the company's relationships with civic and municipal organizations and in coordinating contacts with the press and the public in the western regional area.

Simmons will continue to maintain general customer relationships for the company in the area and to advise and assist sales personnel in direct sales efforts and customer contacts, in the development and marketing of new products, and in improvement of the company's distribution system.

Simmons has been with Blaw-Knox since 1928. He has been successively district sales manager of the Philadelphia office, district manager of the Hadden Heights, N. J., and New York offices, and eastern regional representative for the New York-Philadelphia area.

You'll win more than this prize. You'll increase drilling efficiency and control your mud better. Mud-O-Graf records every variation in mud weight, saving time and costly errors in the addition of weighting materials. All heavy and light streaks in the circulating system and their duration are recorded. Mud-O-Graf shows how often the hole is filled up when coming out of the hole and shows the time of a complete circulation. If it's a question of mud, ask for Mud-O-Graf.

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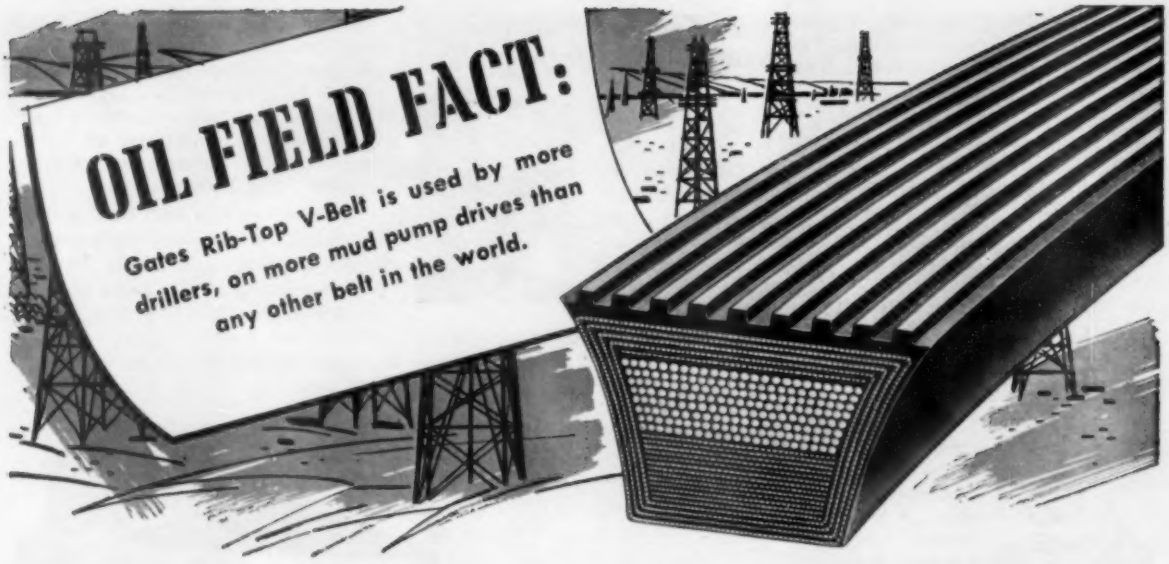

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If you want to reduce V-belt replacements and lower belt costs for mud pump drives, the belt to use is Gates Rib-Top Vulco Rope.

Both Standard and Super Rib-Top V-Belts are available from your oil field supply house. You pay no more for Rib-Tops than for ordinary belts of comparable ratings. Specify Gates Rib-Tops next time you order. The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

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40% greater horsepower capacity. Easily handles drive overloads. Fewer belts and narrower sheaves solve space and weight problems.

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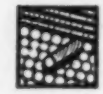
4 Engineering Developments enable Gates Rib-Top to deliver outstanding performance. These developments are the result of *specialized* research by the world's largest belt testing laboratories.



1. Tougher, More Resilient Tensile Cords enable Rib-Top V-Belts to absorb severe pulsations of the mud pump—easily handle peak loads.

2. Concave Sidewalls (U.S. PAT. NO. 1813698) as a Gates belt bends around a sheave the concave sides fill out . . . become straight . . . fit sheave grooves evenly (Fig. A). This uniform groove contact provides sure pulling power, less wear, longer V-belt life.

Straight-sided belts bulge at the sides when bent. Uneven contact (Fig. B) causes uneven wear, shortens belt life.

3. Stabilizing Ribbed Top (U.S. PAT. NO. 2548135) exclusive with Gates. Dampens vibration . . . protects top of belt against damage . . . keeps belt running smoothly over idler equipped mud pump drives, with no side slip.

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Gates Rib-Top Vulco Rope

DEVELOPED ESPECIALLY FOR MUD PUMP DRIVES

Oklahoma Probes Its Deepest Trough

By Frank J. Gardner
Exploration Editor

FOR MANY years, Oklahoma oil finders have gazed at their maps of the vast Anadarko basin and wondered "What's down there—there in its depths, in the 'trough?' " But for most of those years, an estimated depth of 28,000 ft. to basement confined the trough oil search to gazing and wondering.

New superlatives . . . Today, however, with rigs of 5-mile capacity, Oklahomans are actively probing these depths. On the map, three new Oklahoma superlatives are spotted—two of them factual, and the third only "possible." All of them are depth superlatives, and they emphasize the growing obsession with depth that occupies oil finders everywhere today.

At the southeastern end of the basin, British-American Oil Producing Co. has set a new producing depth record for the state at its 1 Kreiger, Section 3-2n-5w. This well, on the Stephens County side of the old Carter-Knox field, flowed commercial gas and condensate from the Oil Creek-Ordovician section at 16,490-16,912 ft. On other tests, it has flowed gas and condensate from the Ordovician second and third Bromide sands at 14,805-82 ft. and 15,134-68 ft.

This is one more forward step in British-American's deep campaign at Carter-Knox, which began in 1956 with the completion of the 2 Harrison for 31 M.M.c.f. of gas and 163 bbl. of condensate per M.M.c.f. daily from third Bromide at 15,250-15,310 ft. These million-dollar wells have opened four new pays for the old field so far and have launched one of Oklahoma's busiest campaigns for 1957.

And new knowledge . . . Stepping out into the deeper reaches of the Anadarko trough, Magnolia Petroleum Co. et al drilled its 1 Sterba as a deep test on old Cement anticline in Caddo County (Section 35-6n-10w). After weeks of probing, testing, and coring, operator finally reached total depth of 20,426 ft., still in Mississippian, and plugged back to test Springer-Pennsylvanian sands at 14,008, 14,310, and 14,415 ft. These proved noncommercial, and Magnolia announced plans for abandonment. Now, however, comes news that Gulf Oil Corp., one of the original supporters, will take over the well for tests of shallower Deese-Pennsylvanian possibilities.

OKLAHOMA BOASTS three new superlatives with a new drilling depth record, a new producing depth record, and a new candidate for the world's depth record. A wildcat aimed at 24,000 ft. is now drilling on the Fort Cobb anticline, Oklahoma's largest nonproductive uplift. Other potential but unproductive anticlines are shown in dashed outlines. Symbols mark previous tests below 15,000 ft.

For a time, this hole threatened to take over as the world's deepest, but this did not develop. Its last reported top was Sycamore - Mississippian at 19,970 ft., 7,062 ft. deeper than top Sycamore at the British-American 2 Harrison, about 30 miles to the southeast.

Now, another Caddo County wildcat is spinning away toward an avowed objective of 24,000 ft., which if attained will indeed hand the world's depth record back to Oklahoma. This one is the Howell, Holloway & Howell 1 Anadarko Basin, in Section 4-9n-12w. It lies on the huge buried Fort Cobb anticline, a 93,000-acre uplift and Oklahoma's largest nonproductive structure. It is 7 miles northwest of the old Superior Oil Co. 1 Weller, world record holder in 1947; the Weller (Section 11-8n-12w) stopped at 17,823 ft., just about 500 ft. short of the Caney-Mississippian.

Will change our thinking . . . This new ultradeep wildcat will cost somewhere between 1½ and 2 million dollars and operators estimate it will take 465 days to drill. Prime objective is the Ordovician section which is paying off so handsomely now at Carter-Knox. Its findings will be of great significance to future Anadarko drilling, and it's a safe bet that we'll have to change all estimates of thicknesses in the trough upon completion of the 1 Anadarko sometime in 1959. Even the Sterba found the top Mississippian about 1,500 ft. deeper than most previous guesses had pinpointed it.

The accent, then, is on depth in Oklahoma. The gazing and the wondering continue to intrigue the oil finder, but new and improved drilling tools are bringing closer the day of actual knowledge about "what's down there?"

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Alaska's Outlook Is Brighter Now . . .

. . . and here are some reasons why

- Swanson River oil field is a major discovery.
- Navy Petroleum Reserve No. 4 is a big asset.
- Operations parallel methods proved in Canada's north country.
- Logistics follow a vast experience of industry and armed services.
- Economics is comparable to the usual foreign program.
- Petroleum prospects occur in nine recognized districts.
- The spirit of competition pervades the length and breadth of Alaska.

By Thomas C. Hiestand
Consulting Geologist, Denver

THE MAGNITUDE of the recent Alaskan discovery is dawning on the oil industry. Richfield Oil Corp. 1 Swanson River unit recovered oil in the drill stem at 11,131-70 ft. on July 19, 1957. On September 28, the well was completed through perforations in 5½-in. casing at 11,150-11,-215 ft. Initial production was 900 bbl. per day flowing through 1½-in. choke of 31°-API-gravity crude oil and 122,000 cu. ft. of gas per day.

Unofficially it is reported that the area on closed structure exceeds the 71,680 acres within the unit area and amounts to 100,000 acres or more, and it is reported that additional Tertiary sandstone beds are oil saturated besides the perforated interval of 65 ft. A recovery of 10,000 bbl. per acre could mean reserves of 1 billion barrels for the oil field, therefore the results of Richfield's Alaskan development in coming months and years will be closely followed by all operators in the States. Significantly, Standard Oil Co. of California, Western Operations, Inc., earmarked a fund of $30,000,000 for exploration and development on the Kenai Peninsula in its joint account with Richfield.

A SINGLE geologic land mass ties North America to Asia, with Alaska in a pivotal position, midway between the United States and Japan.

Fifty-year search . . . Alaska's first major discovery was preceded by 50 years of unrelenting search in the several districts of southern mainland, sparked by the shallow, noncommercial Katalla oil pool. Now we know that geologic conditions exist conducive to oil and gas accumulation in multimillion-barrel oil fields, and it becomes a simple matter to forecast that at least a dozen more major fields will be discovered in Alaska during the ensuing decade. We can base the statement on parallels such as the Leduc discovery in Alberta just 10 years ago, the Mexia discovery in Texas about 35 years ago, the Louden discovery in Illinois 20 years ago, and many other places where major fields are now producing.

All of us can recall our mixed reactions in 1950 when we learned that Arctic Contractors completed the 5 Umiat well on the pump at 1,077 ft. for its initial production of 400 bbl. of 35°-API-gravity crude oil per day, in Navy Petroleum Reserve No. 4, on the Arctic slope. "So what?" we said in 1952 when the contractors tested 12 gas sand zones in two wells at Gubik on withdrawn lands, gaging 3 to 8 million cubic feet per day, respectively, at depths ranging from 1,000 to 4,000 ft. What significance did we attach to the tests in the No. 5 well at South Barrow when the contractors had a gage of 8 million cubic feet of gas per day at 2,456 ft.?

Accumulations in these fields are in the Cretaceous (Albian) sandstone and silt beds equivalent to the Dakota group of the States and the

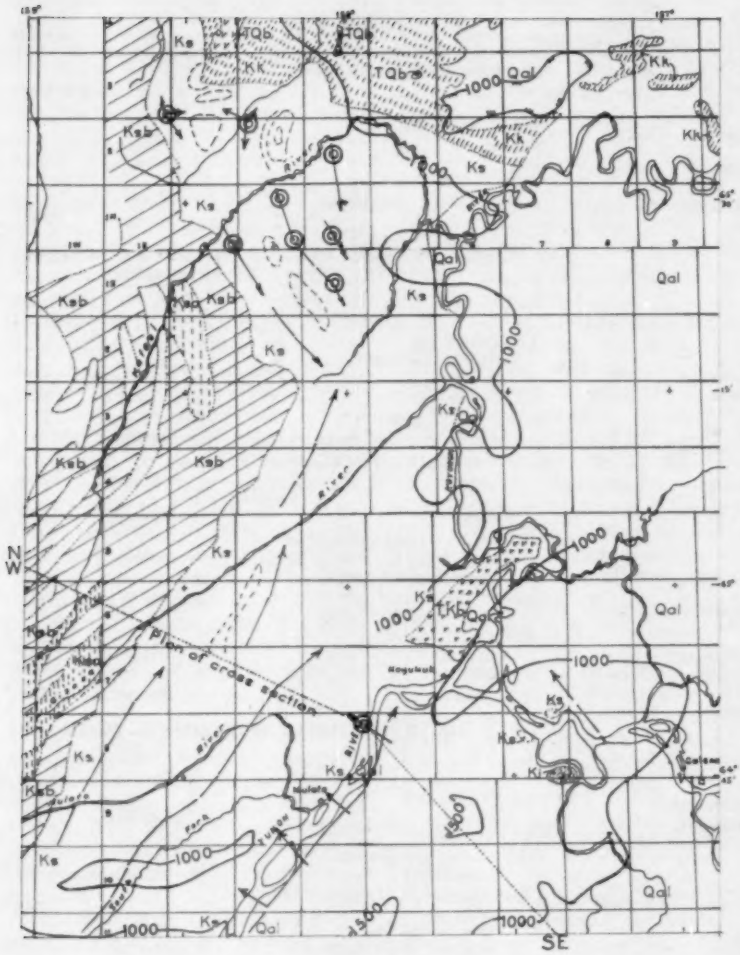
ALASKAN MAINLAND covers area twice that of Texas and locates Swanson River oil field 600 miles south of the Umiat oil field.

Viking beds of western Canada. Now we are aware that the Arctic slope operations carried on from 1945 to 1955 established reserves estimated to be 100 million barrels of 35°-API-gravity crude oil and more than 500 billion cubic feet of 1,000-B.t.u. gas. Before 1954 the Alaska Development Board at Juneau began activities for financing a gas-transmission pipeline from Gubik to the railbelt including Fairbanks and Anchorage. Activities ceased at Navy Petroleum Reserve No. 4; however, these results are a big asset in Alaska's outlook. Sooner or later we can expect important producing areas to be developed in the Arctic foothills and Coastal Plain districts.

Climate a severe obstacle . . . The volume of operations in Alaska according to Miller (1957) has been less than 200 wells drilled which is tiny compared to operations in Canada's northland over the past 20 years. Stateside personnel entered Canada confronted with a severe mental bar-

THOMAS C. HIESTAND

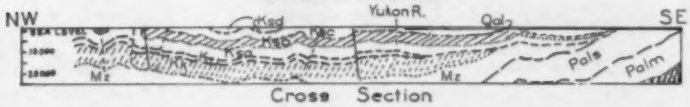
Thomas C. Hiestand is a consulting geologist, Denver, and concentrates on areas in the Rocky Mountain states, western Canada, and Alaska. He received an A.B. degree in geology at Indiana University and spent a season in the field on the state survey. In 1936 he became consultant with the I.T.I.O. Co., Bartlesville, and joined Cities Service Oil Co. in 1941 as staff geologist, Casper. He joined Texota Oil Co. in 1953.



EXPLANATION

Qal	alluvium	QUATERNARY	
TQb	basalt flows	TERTIARY	TKb basalt flows
Ks	Shaktolik group Units C&D bed of white pebble conglomerate	CRETACEOUS	intrusive
Ksb	Unit B		Ksa Unit A
KK	Koyukuk group		Ku Ungalik conglom.
Palm	Paleozoic metasediments		Mz Jurassic, Triassic
PC	Precambrian basement		Pals Paleozoic fm.
	anticline	1000 / 1500 Isogams Airborne Magnetometer	Closure

0 2 6 12 18 miles



GEOLOGIC MAP of the central portion of the Koyukuk district in Central Alaska shows intrusive and extrusive features remindful of the oil and gas-producing San Juan basin in New Mexico.

rier in overcoming dread and fear of the northland; however, the Canadians set good examples in all kinds of field jobs and helped men from the States adjust to the work splendidly. In Alaskan operations, the tendency is to put Canadians or seasoned men from the States in charge.

In the choice of all equipment the same tendency is true. Supplies and services found best in Canadian operations are requisitioned for Alaskan jobs of similar requirements. Winter operations extend from November to May across the vast north lands of Canada and Alaska; these are not found to be more hazardous than in the belts of heavy rains and storms in the various states as far as the health of men and effect on equipment are concerned.

Logistics in moving men and equipment in the armed services and in industry for construction of bases and lines of communications has become highly refined. Consultants who formerly worked on the staff of Arctic Contractors are available to solve all logistics problems in Alaska. Procurement of supplies and services can best be handled by experienced engineers and expediters rather than by sending in statewide employes, at least initially. Aviation has become dependably established all over Alaska, with scheduled lines and chartered services.

Navigation on the principal rivers of the interior has been in operation for more than 50 years. The Alaska Highway and year-around connecting highways provide overland facilities connecting Anchorage and Fairbanks with transportation via Canada to the States. The Alaska Railroad operates modern diesel trains between the seacoast at Anchorage and the rivers and highways at Fairbanks. Almost a third of the highway is built west of Fairbanks to the west coast at Nome.

Expensive exploration . . . Economics involved in all operations of exploration and exploitation follows the pattern associated with the usual foreign operations; that is to say, it is not possible to set up cost estimates for remote localities unless fortified with imaginative contingency funds. Alaska is legally a territory of the United States. Its population can be estimated at about 200,000, including Aleuts, Indians, Eskimos, Asiatics, and emigrants from the States.

Wages and costs of material are higher than in the States and in Canada generally speaking. Shipments by land, air, or water increase consumers' costs until manufacturing is increased and this increase depends upon local production of oil and gas

TABLE 1—STRATIGRAPHIC SUMMARY OF ALASKAN DISTRICTS

GULF COASTAL BELT

		Thickness (ft.)
TERTIARY		
Miocene and Pliocene:		
Yakataga fm. and Katalla fm.	Marine	10,000+
Oligocene:		
Poul Creek fm. and Tokun fm.	Marine	6,100
Eocene:		
Kulthieth fm. and Kushtaka fm.	Nonmarine	9,300+

KOYUKUK DISTRICT

QUATERNARY		
alluviated basin at Galena		
CRETACEOUS, LOWER (Albian)		
Shaktolik group:		
Unit d	Nonmarine	4,000
Unit c	Marine	3,500
Unit b	Marine(	
Unit a	Marine(	4,000
Ungalik conglom.	Nonmarine?	1,000
(Neocomian)		
Koyukuk group	Marine?	4,000

KANDIK-PEEL DISTRICT

		Cum. thickness (ft.)
TERTIARY		
Eocene unnamed	Nonmarine	58,000
CRETACEOUS, up. low.:		
Kandik fm.	Marine and nonmarine	55,000
TRIASSIC, up.		
Unnamed	Marine	52,600
PERMIAN		
Tahkandit ls.	Marine	51,000
PENNSYLVANIAN		
Nation River fm.	Marine and nonmarine	50,500
Unnamed basal unit		44,500
MISSISSIPPIAN		
Calico Bluff (Chester-Meramec)	Marine	43,500
Livengood chert	Marine	42,000
DEVONIAN, up. mid. low.		
Unnamed unit	Marine	41,000
Salmontrout ls.	Marine	40,000
SILURIAN		
Unnamed unit (Niagaran)	Marine	39,500
ORDOVICIAN		
Unnamed lower unit	Marine	32,600
CAMBRIAN		
Unnamed upper unit	Marine	31,600
Unnamed middle unit	Marine	29,600
PRECAMBRIAN		
Tindir group:		
Unit a	Marine	28,600
Unit b	Marine	26,900
Unit c	Marine and nonmarine	24,400
Unit d	Nonmarine	22,000
Unit e	Marine	21,000
Unit f	Marine	11,000
Unit g	Marine and nonmarine	10,000
Birch Creek schist, beginning of measurements		0

Note: In addition to the sedimentary sequence recorded here, there are two local sequences of volcanic rocks and interbedded sedimentary rocks as follows:

		Thickness (ft.)
MISSISSIPPIAN		
Rampart group	Marine and nonmarine	5,000
DEVONIAN		
Woodchopper volcanics	Marine and nonmarine	7,500

ALASKA PENINSULA, KENAI PENINSULA, SUSTINA DISTRICT, COPPER RIVER DISTRICT

		Thickness (ft.)
TERTIARY		
Paleocene and Eocene:		
Wishbone fm.	Nonmarine	1,850
Chickaloon fm.	Nonmarine	4,000
CRETACEOUS, UPPER		
Matnuska fm. and Kaguyak fm.	Marine	10,000
CRETACEOUS, LOWER (Albian)		
Kennicott	Marine	3,200
(Neocomian)		
Nelchina ls.	Marine	1,000
JURASSIC, Upper and Middle		
Naknek fm.	Marine	6,000
Chisik congl. mbr.		
Chinitna fm. and Shelikof fm.	Marine	1,250
Tuxedni fm. and Kialagvik fm.	Marine	6,500
JURASSIC, lower		
Unnamed	Marine	2,300
TRIASSIC		
Unnamed	Marine	2,200

ARCTIC FOOTHILLS AND COASTAL PLAIN

		Thickness (ft.)
QUATERNARY		
Gubik fm.	Nonmarine	150
TERTIARY:		
Paleocene and Eocene:		
Sagavanirktok fm.	Nonmarine	2,000
CRETACEOUS, Upper and Lower		
Colville group		5,000
Brine Creek fm.	Nonmarine	
Schrader Bluff fm.	Marine	
Kogosukruk tongue	Nonmarine	
Sentinental Hill mbr.	Marine	
Tuluga mbr.	Marine	
Tuluvak tongue	Nonmarine	
Seabee mbr.	Nonmarine	
Nanushuk group		5,500
Chandler fm.	Nonmarine	
Umiat fm.	Marine	
Topagoruk mbr. Oil pay zone.		
CRETACEOUS, Lower		
Torok fm.	Marine and nonmarine	10,000
Okpikruak fm.	Marine	1,850
JURASSIC, up., mid., low.:		
Kingak sh.	Marine	4,500
TRIASSIC, up.		
Shublik fm.	Marine	300+
PERMIAN		
Sadlerochit ss.	Marine	500
MISSISSIPPIAN		
Lisburne ls. (Meramec)	Marine	3,000
Noatak fm. (Kinderhook?)	Marine	5,000+

Stratigraphic summary by Alaskan districts suggests large petroleum resources.*

- Gulf Coast Belt, 35,000 ft. Cenozoic formations; Katalla shallow oil field.
- Alaska Peninsula, Kenai Peninsula, Susitna and Copper River, 32,000 ft. Mesozoic formations; 12,000 ft. Cenozoic in Swanson River oil field.
- Arctic Foothills and Arctic Coastal Plain, 35,000 ft. Upper Paleozoic and Mesozoic formations; Umiat oil field and Gubik gas field.
- Kandik-Peel, 25,000 ft., Paleozoic and Mesozoic formations.
- Koyukuk, 20,000 ft., Paleozoic (not outcropping) and Mesozoic formations.

*Undiseovered resources are related to sedimentary formations in cubic miles.

in Alaska. Consequently the producer will be able to obtain a commensurate income in the economic scale as it adjusts to a balance in supply and demand. When production rises to a rate for export, the route of travel is relatively short to Asia and the Pacific Northwest by tanker.

The bright outlook for Alaska partially stems from its geologic conditions and the numerous petroleum prospects located in nine districts of its northern, central, and southern regions. The geology of Alaska is beginning to be known and to be understood, although much of the surface has not been studied as yet. Stratigraphic geology requires much time and hard work, and without knowledge of the rock characteristics and means to correlate formations over small and large areas we cannot hope to find major oil and gas fields. Such work is done by trained field and laboratory stratigraphers whose names are seldom in headlines. The results are sometimes considered academic and management frequently sets up exploration programs without giving enough attention to this important phase.

Comparison with known oil areas . . . Oil production obtained throughout the States and western Canada in formations ranging from Cambrian to Permian has been of major importance and operators expect similar important discoveries to be made in Paleozoic formations mapped in the Arctic foothills and Kandik-Peel districts. Actually, on the geologic map of North America one can observe the continuation of such outcrops along the Rocky Mountains and Brooks Range uplifts.

The great Salt Creek field of Wyoming, Pembina field of Alberta, and hundreds of others in the States and Canada produce from formations ranging from Triassic to Cretaceous. Likewise it is possible to trace the geologic basins containing the Mesozoic formations as they stretch northwestward flanking the mountain uplifts on the geologic map. Mesozoic formations are mapped in Alaskan districts including the Arctic Coastal Plain and Foothills, Koyukuk district, the Kandik-Peel district as well as in the southern region's Alaska Peninsula, Kenai Peninsula, Susitna, and Copper River districts.

Petroleum developments in the Pacific coastal basins of California, along the coast and offshore in the Gulf of Mexico in Texas and Louisiana, have important places in the oil business. Production in these fields is obtained chiefly from various sandstone beds of the Tertiary formations, Cenozoic in age. And recently these formations made the headlines in Northwest Washington when Ocean City field had a flowing well. For Alaska an auspicious beginning has been realized with a well flowing oil from a Tertiary formation in the Swanson River field; operators with experience in California fields spoke eloquently by their financial planning to indicate that the petroleum industry has suddenly expanded into the billion-dollar bracket in Alaska.

Perhaps the important point in considering petroleum possibilities in Alaska is the tremendous scope of geologic formations which have been deposited and preserved in the large basins, ranging in order from the oldest to youngest, that is from the Cambrian up to Miocene, Tertiary. It is interesting to observe that the deposition of these formations in Alaska provides fossils clearly revealing waters mingled between the mainlands of North America and Asia. In other words, Alaska is a meeting ground and not an isolated place. We most often emphasize the frigid North when we think of Alaska, however, geologically its climate was generally equable for growth of plants and animals and conducive to the origin of oil and gas.

Payoff will be big . . . Due to Alaska's pioneering stage in exploration, the wildcatter is always looking for an Elk Basin and a Turner Valley field because of the financial cost of original facilities for production and transportation to markets. Consequently, the typical petroleum prospect is one which involves land in amounts of 100,000 to 1 million acres. Structurally, a vertical closure of 500 to 5,000 ft. is expected; reversal of anticlinal dips will range from 1,000 to 10,000 ft. Outside of the early exploration it is a mistake to take into account only these spectacular features and to ignore the features with closure of 50 to 500 ft. which are commercially important in Saskatchewan or in Texas.

In a brief article a discussion of nine districts is not feasible. Personal experience in the Koyukuk district over the past several years facilitates a narrative account. Fairbanks Oil & Gas Co. was organized by business and professional men in Fairbanks who had returned from Barrow when the program was discontinued in Navy Petroleum Reserve No. 4. It engaged Geophoto Services, of Denver, to prepare a photogeologic report and it dealt with Texota Oil Co., of Denver, to carry on exploration in the Kateel River locality.

Concurrently, the U. S. Geological Survey, Alaskan branch, brought geologists from the north slope of the Brooks Range to the Koyukuk basin and did photogeologic and field mapping the past 4 years. Global Enterprises, of Denver, joined with a number of independent operators in a program it has supervised in geologic and geophysical mapping. Tedious, painstaking work has generally gone unnoticed and when a well discovers oil and gas we may take time to find out why it happened.

Acknowledgments and References

Permission has been granted for use of material making this article possible for which thanks are due Texota Oil Co., Schermerhorn Oil Corp., Peerless Oil & Gas Co., and Arrowhead Exploration Co. Ewell H. Stone and E. R. Bigelow have been helpful. C. W. Snedden, publisher, Fairbanks Publishing Co., Inc., furnished copy of Alaska Development Board Report and has been generous in time and help. George O. Gates, chief of Alaskan branch, U. S. Geological Survey, has expedited publication of maps and reports of great value to the industry. Many others have discussed the problems and helped in innumerable ways.

1. D. J. Miller, G. Payne, Geo. Gryc. (1957) Geology of possible petroleum provinces, open file report, USGS Alaskan branch, 239 pp. ms.

2. W. W. Patton, Jr., R. S. Bickel (1957) Preliminary geologic map and sections along the lower Koyukuk River, Alaska, open file map, USGS A'askan branch.

3. W. W. Patton, Jr., R. S. Bickel (1937) Geologic map and structure sections along part of the lower Yukon River, Alaska. Map I-197, USGS.

4. R. S. Bickel, W. W. Patton, Jr. (1956) Preliminary geologic map of the Nulato and Kateel rivers area, Alaska, open file map, USGS Alaskan branch.

5. J. W. Dalton (1954) Report, possibility of commercial development of Gubik gas field and use of natural gas as a source of heat and power in the railbelt area of Alaska, Alaska Development Board, 75 pp.

6. T. G. Payne (1951) Geology of the Arctic Slope of Alaska, Map OM 126, USGS, 3 sheets.

The first reference has a bibliography in which 109 USGS publications as of January 1, 1956, are listed and therefore the list is not duplicated here.

The USGS Topographic branch in Denver has topographic sheets and air photos covering a large portion of Alaska.

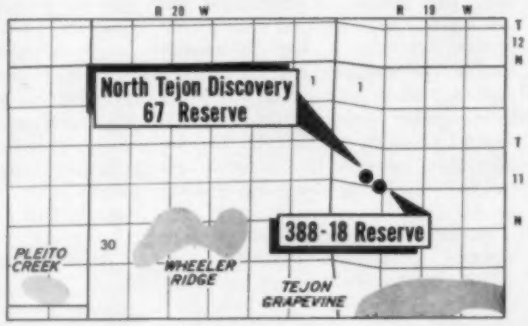
The USGS has Map E (1954) of Alaska printed in yellow and also in shaded relief.

7. J. T. Dutton, Jr., T. G. Payne (1957 Geologic Map of Alaska, 1-2,500,000 in color, USGS.

Land surveying covers only areas in Alaska. For oil and gas leasing on U. S. Public Domain land descriptions are made in metes and bounds from U. S. Coast and Geodetic Survey benchmarks plus the section, township, range description. Director of the Bureau of Land Management has issued decisions on principal meridians including Kateel River, Umiat, Fairbanks and Seaward, and cadastral engineers have furnished land offices with protracted surveys in guide meridians and standard parallels on topographic sheets.

EXPLORATION HIGHLIGHTS

CALIFORNIA



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A new Cypress (Chester-Mississippian) discovery in Posey County is Clark & Clark 1 Wilford Hagemann in SE NE SE 33-6s-14w, ½-mile step-out test in the area 5 miles northwest of Mount Vernon. The well pumped 69 bbl. of oil per day from Cypress sand at 2,474-90 ft.

LOUISIANA

NORTH

DeSoto Adds Paluxy Field

A small Paluxy discovery is reported 2 miles southeast of Oxford, in DeSoto Parish. It is by John C. White, of Greggton, Tex., at his 1 Joyner, in 28-11n-12w.

The well, completed on the pump is making 42°-gravity oil with pay at 2,884-90 ft. It was drilled to 3,066 ft.

SOUTH

New Oil Pay Produces in Old St. Martinville Field

The old St. Martinville field, in St. Martin Parish, is adding another producing reservoir with completion by Texas Pacific Coal & Oil Co. of its 1 Domengeaux in oil-pay perforated at 6,492-95 ft.

The new well is rated good for 168 bbl. per day, flowing through ⅛-in. choke. Gravity of the oil is 35.6°. Flow is with gas-oil ratio of 480 cu. ft. per day.

Discovered in 1935, this field has proved productive from at least a dozen separate reservoirs.

OFFSHORE

Fifth Well Completed in Deep Ship Shoal Field

Ocean Drilling & Exploration Co. has completed its fifth well on its wholly owned State Lease 1527, in Block 67, Ship Shoal Area, off the coast of Terrebonne Parish.

The well, drilled to 12,325 ft., is productive of gas and condensate from perforated interval at 12,150-62 ft. Through ⅛-in. choke its flow was

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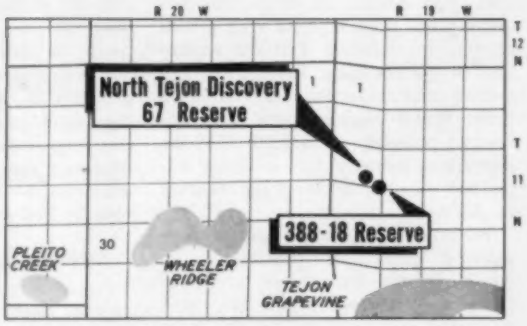

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INDIANA

Completion Reported At Posey County Strike

A new Cypress (Chester-Mississippian) discovery in Posey County is Clark & Clark 1 Wilford Hagemann in SE NE SE 33-6s-14w, ½-mile step-out test in the area 5 miles northwest of Mount Vernon. The well pumped 69 bbl. of oil per day from Cypress sand at 2,474-90 ft.

LOUISIANA

NORTH

DeSoto Adds Paluxy Field

A small Paluxy discovery is reported 2 miles southeast of Oxford, in DeSoto Parish. It is by John C. White, of Greggton, Tex., at his 1 Joyner, in 28-11n-12w.

The well, completed on the pump is making 42°-gravity oil with pay at 2,884-90 ft. It was drilled to 3,066 ft.

SOUTH

New Oil Pay Produces in Old St. Martinville Field

The old St. Martinville field, in St. Martin Parish, is adding another producing reservoir with completion by Texas Pacific Coal & Oil Co. of its 1 Domengeaux in oil-pay perforated at 6,492-95 ft.

The new well is rated good for 168 bbl. per day, flowing through ⅛-in. choke. Gravity of the oil is 35.6°. Flow is with gas-oil ratio of 480 cu. ft. per day.

Discovered in 1935, this field has proved productive from at least a dozen separate reservoirs.

OFFSHORE

Fifth Well Completed in Deep Ship Shoal Field

Ocean Drilling & Exploration Co. has completed its fifth well on its wholly owned State Lease 1527, in Block 67, Ship Shoal Area, off the coast of Terrebonne Parish.

The well, drilled to 12,325 ft., is productive of gas and condensate from perforated interval at 12,150-62 ft. Through ⅛-in. choke its flow was

at the rate of 2,200,000 cu. ft. of gas and 54 bbl. of condensate per day. Pressure was 4,500 psi. Gravity of the condensate was 49°.

The field was discovered in 1955. Its first two wells were oil-productive, one in a 12,100-ft. pay and the other at 9,800 ft. The new well is the third gasser.

MICHIGAN

Two Oceana Wildcats Top Drilling Interest

Two exploratory tests in Crystal Township, Oceana County, held top interest. Robert Bonds 1 Rowley, SE SE 16-16n-16w, will test Dundee lime oil pay at 2,401 ft. after drilling to 2,481 ft. Outpost carried 300 ft. oil and water at 2,401 ft., 9 ft. in lime.

● McClure Oil Co. 2 State, NW SW 7-16n-16w, wildcat, bottomed at 2,359 ft. without oil or gas in Dundee objective and will plug back to retest pay in Traverse lime at 1,694-98 ft.

NORTH DAKOTA

Deep Discovery Completed In Beaver Lodge Field

Amerada Petroleum Corp. has completed its important deep test, the 1 Boe Olson Unit, NE SW NE 15-155n-96w, Beaver Lodge field, Williams County. The well is both a Devonian and Silurian producer.

Production was 351 bbl. of oil and 29 bbl. water per day from the Devonian and 360 bbl. of condensate and 45 bbl. of water daily from the Silurian. Beaver Lodge, and adjoining Nesson anticline fields, all produce from the Madison-Mississippian. This is the first ultra deep producer in the field. Another try is the 1 Iverson-Nelson Unit, the state's deepest hole. Tests are still going on at this wildcat. There are four other deep wildcats drilling in the field.

OKLAHOMA

PANHANDLE

Big Gas Wells Finaled In Texas County Areas

Cities Service Oil Co. 1-A Welch, C NE SW 3-4n-15eCM, was completed inside Hugoton field, Texas County, flowing 205,000 M.c.f. of gas per day from the Morrow sand at 6,032-78 ft.

Carter Oil Co. finaled its 1 Joliffe, C NW SE 27-3n-18eCM. Texas County, flowing open flow potential of 94,000 M.c.f. per day from Morrow sand at 6,336-56 and 6,422-34 ft.

SOUTH

Production Tests Under Way at Enville Discovery

Production tests reportedly came up with impressive flows at Pasotex Petroleum Co.'s 1 Brannan discovery at Enville, Love County. The wildcat flowed 1,500 M.c.f. of gas per day with 100 bbl. distillate per million from perfoartions at 14,010-20 ft. in the Oil Creek-Ordovician sand. A test at 13,948-14,020 ft. got 215 bbl. of condensate per day on ⅛-in. choke. The last test flowed 3,410 M.c.f. of gas per day on 14/64-in. choke with 67 bbl. of distillate per million.

Reports state that the ultimate recovery at this well from the Oil Creek sand might be as mucn as 125,000 bbl. of condensate with 3,000 billion cubic feet of gas.

SOUTHWEST

New Pay Found at North Carter Field

The Des Moines-Pennsylvanian is a new pay prospect for Shell Oil Co.'s recent North Carter-Springer discovery in Beckham County.

The 1 Patten, C NW SE 9-9n-22w, got 2,140 ft. of oil, 2,935 ft. of oil and gas cut mud and 2,400 ft. of heavily gas-cut and slightly oil-cut mud on tests at 8,707-83 ft. This zone is about 1,500 ft. higher than the Springer-Pennsylvanian field pay zone.

NORTHWEST

Tune Discovery Completed in Ellis County

Pan American Petroleum Corp. has completed a wildcat in northwestern Oklahoma for good recovery of gas.

Pan American et al 1 Tune, located in 35-24n-23w, Ellis County, was completed for a calculated open flow potential of 16,500 M.c.f. of gas a day. It flowed at the rate of 6,000 M.c.f. a day through 31/64-in. choke.

Recovery was from the Morrow sand, topped at 7,849 ft. with total depth at 8,150 ft., plugged back to 7,900 ft. Perforations were at the interval 7,855-76 ft. The well is shut in, awaiting market.

Nearest Morrow production to the 1 Tune is about 7 miles to the southwest in South Salon field.

Pan American is operator of the well, owns 66⅔ per cent interest in it and has about 5,000 acres in the area.

CRINER HILLS FIELD CONFERENCE, LAKE MURRAY AREA, SOUTHERN OKLAHOMA. Published by Ardmore Geological Society. 79 pp. $6.50.

This is the official guide book of the Ardmore Geological Society's Field Conference in the Criner Hills of Southern Oklahoma, September 1957. Included in the book are papers on Southwest Ardmore field, South Overbrook field, Northeast Greenville field, Brock field, notes on the Southwest Envi le field, a discussion of the lithologic variations in the Devil's Kitchen member of the Deese formation, clarification of Des Moinsian stratigraphy in the Pleasant Hill Syncline, a list of the publications of the Ardmore Society, and a biographical sketch of Dr. E. A. Fredrickson and Dr. H. E. Hunter.

The book includes the official road log of the conference, and maps of the Criner Hi ls area, a surface geology map of the Southern Ardmore basin, a pre-Atokan Paleogeologic map of the Criner Hills axis, and a photomosaic map of the Criner Hills area. There are numerous illustrations in the guide book.

The executive committee of the Ardmore Geological Society for 1957 is listed in the book, thusly: president, Robert W. A len, Continental Oil Co.; past president, Fred B. Jones, Jr., Sinclair Oil & Gas Co.; vice president, Clinton E. Nearhood (deceased), Continental Oil Co.; secretary, Jerry L. Womack, Phillips Petroleum; treasurer, Ed S. Rouget, Jr., The Texas Co., and members, Ward L. Hall, Sinclair Oil & Gas Co., and Jack W. Wi liams, Tripledee Drilling Co.

ROCKY MOUNTAINS

WYOMING

Big Gas Flow Gaged At Big Piney Well

Gulf Oil Corp. has a big gas well at its 5 Tresner-State, C SW NE 36-29n-113w, Big Piney, Sublette County. The well flowed gas at the rate of 18,800 M.c.f. per day. Perforations were at 2,600-2,886 ft.

Location of the now shut-in well is southeast of the new-pay discovery of late at Belco Petroleum Co. B-34 in C SW SW 25-29n-113w. This well swabbed 140 bbl. of oil per day.

Minnelusa Discovery Hinted At Powder River Wildcat

Trigood Oil Co. reportedly found oil on drill-stem test of the Minnelusa-Pennsylvanian at its 1 Ingram-A in N½ NE SE 9-54n-77w, Sheridan County. The unofficial reports give the oil recovery on a test at about 10,458 ft. Casing is being run according to reports.

The Arvada area wildcat is in the northern Powder River basin in an area of very little previous drilling

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a new Halliburton product for better oil well cementing

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Placed above the uppermost float valve, the Self-Fill Differential Collar offers these important advantages:

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- Faster, easier flushing of cuttings and settlings from float valves

Super Seal Float Shoe

Super Seal Float Collar

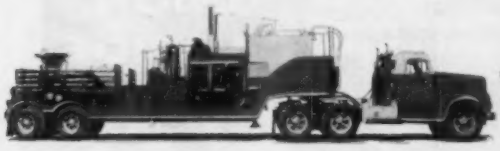
Three unique features of this new Halliburton Self-Fill Differential Collar help to provide greater safety from blowout dangers:

1 Use of Super Seal Float Collar in conjunction with the Self-Fill Differential Collar helps to eliminate dangerous low pressure areas which often promote blowouts. Unlike conventional fill-up devices, this safer combination does not restrict the downward flow of fluids when casing is raised.

2 Very low differential pressure between annulus and the inside of casing is maintained by a special spring-loaded valve. The resulting head difference of only 100-150 feet, compared with 1,000-2,000 feet for most automatic fill-up devices, increases operator control over blowout dangers.

3 Casing is filled from side ports *above* the end of casing...where mud is cleaner, reducing the possibility of plugging.

Ask your Halliburton representative for full details on the new Self-Fill Differential Collar or write for a descriptive, illustrated bulletin.



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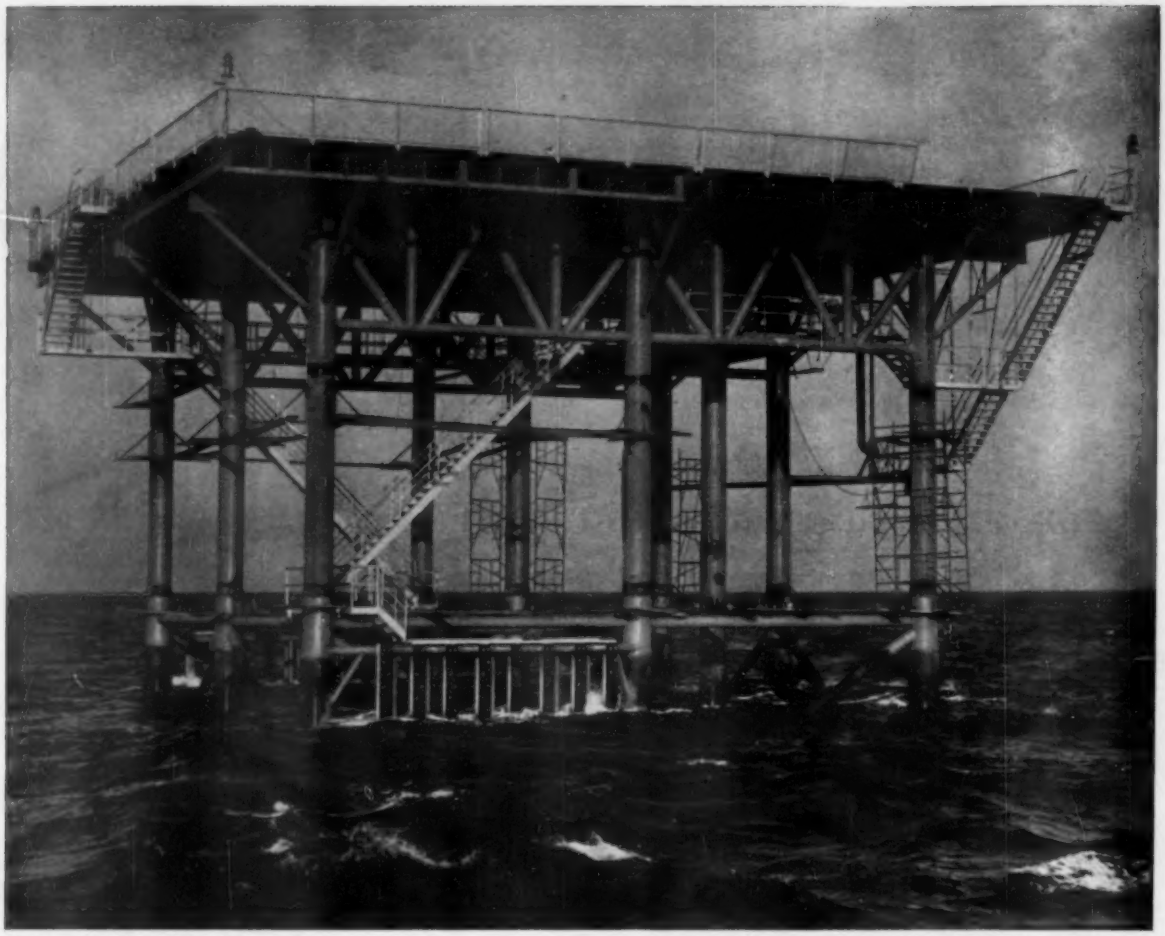

Photo: courtesy Brown & Root Inc.

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Vinyl resin coatings prove superior for

painting off-shore structures

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activity. The Minnelusa produces at Donkey Creek, a major 1957 discovery in the basin. This portion of the basin has only two other pre-Cretaceous producing area . . . Mitchell Creek and Adon. If the Trigood discovery is a success, it could well start another deep drilling play in the northern Powder River basin.

COLORADO

Southwest Gets New Paradox Activity

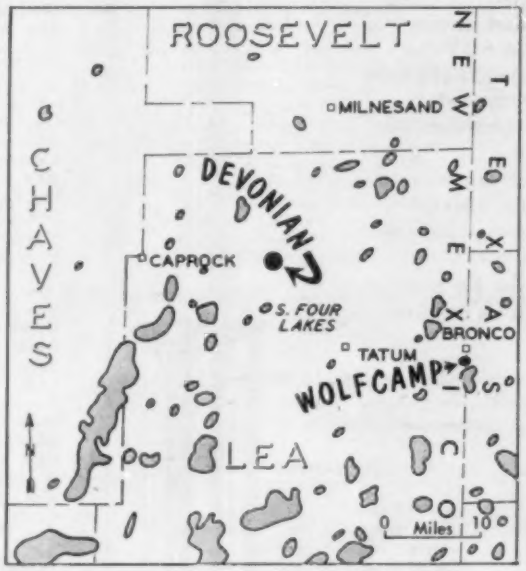
Deep tests are growing in number in the Paradox basin portion of southwestern Colorado with five companies in action.

Carter Oil Co. is rigging up at the Spargo Unit, 1 Spargo Unit-Government in NW SW NE 14-39n-19w, Dolores County, planning to go to 6,300 ft. to test the Paradox.

Carter is also busy at 1 Glade Unit in C NE SW 11-41n-17w, Dolores County. Ray Smith Drilling Co. is busy below 2,947 ft. at 1 Brown in Dolores County, C NW SE 13-40n-13w. Vaughey & Vaughey have one going in Montezuma County at 1 Ute Mountain Tribal-B, C SW SW 21-33n-19w. They also are drilling at 1 Ute Tribal-A in SW SE SE 12-34n-20w.

Pan American Petroleum Corp. 1 Unit, SE NW NW 10-35n-20w, is coring at 5,535 ft. This is on the Mockingbird Creek Unit. Hathaway Co. and Big Horn-Powder River Corp. 1 Government in SE SE SW 11-37n-20w, Montezuma County.

NEW MEXICO



Lea County discoveries. Devonian well is Sinclair 1 State-Lea, while the Wolfcamp is R. C. Lipscomb 1 Harris.

Two Finds in Lea County Basin Open New Pools

The big unnamed basin which centers mostly in the northern half of Lea County gained two deep discoveries last week. Sinclair Oil & Gas Co. completed a Devonian well in the undeveloped area northwest of Tatum, and on the eastern border, R. C. Lipscomb opened Wolfcamp production, after finding the Devonian dry.

Sinclair's well, 1 State-Lea "840," flowed 198 bbl. of 47°-gravity oil a day on final test, from Devonian perforations at 13,115-53 ft. Choke size was 48/64-in.

Location is SW SW 1-11s-34e. Nearest comparable production is about 6 miles south in South Four Lakes field. Sinclair was said to hold approximately 2,500 acres in the immediate area of the discovery.

R. C. Lipscomb 1 H. W. Harris is located 1 mile southwest of Bronco townsite, on the eastern side of Lea County, in NE NW 2-13s-38e.

Completion potential from the Wolfcamp was 216 bbl. of oil a day through ¼-in. choke. Perforations were at 9,047-64 and 9,072-90 ft. This well was drilled as a Devonian test, to total depth 11,918 ft., then plugged back to 9,465 ft.

Formation tops were: Wolfcamp 9,050 ft., Mississippian 11,199 ft., Woodford 11,850 ft., and Devonian 11,903 ft. Derrick floor elevation was 3,809 ft.

Nearest comparable produtcion is 1 mile to the southeast in Bronco (Devonian and Wolfcamp) field.

Outpost test . . . Zapata Petroleum Corp. 1-10 State, 10-10s-32e, recovered oil while drill-stem testing a Pennsylvanian zone at 8,868-8,944 ft. Recovery in 2 hours was 400 ft. of oil and gas-cut mud, 2,200 ft. of oil and 4,400 ft. of salt water. Location is 1 mile northwest of a recent Pennsylvanian gas-distillate discovery, in northwestern Lea County. Operators drilled ahead after the test, toward contract depth of 10,800 ft.

Roosevelt County . . . Felmont Oil Corp. 5 Bluit last week was drilling below 9,036 ft. in lime and shale following a drill-stem test at 8,932-95 ft. Recovery in 2 hours was 2,172 ft. of gas in drill pipe, 148 ft. of gas-cut mud and 60 ft. of slightly oil-cut mud.

Location is NW SE 27-7s-37e in southern Roosevelt County. It is 12 miles east of the town of Milnesand and 8 miles northeast of Crossroads field.

TEXAS

EAST TEXAS

New Test Located on Hainesville Salt Dome

British American Oil Producing Co. has made location for a test in the area of its Hainesville salt dome discovery last year.

Drillsite for the new project is on a 700-acre tract in the James Brewer Survey, A-26. It is on a block of approximately 6,500 acres held by British American, lying 6½ miles east-northeast of Mineola and 3 miles south of Hainesville townsite. Location is about 2 miles southeast of BA's Weisenhunt, discovery which went through the salt overhang and into the Woodbine pay around 9,217 ft. The discovery was completed for 259 bbl. of oil a day. Recent production reports credit the well with 60 bbl. of oil a day.

British American's new try will be 1-B James B. and Walter E. Judge. Proposed depth is 11,000 ft.

Rusk County . . . Trice Production Co. 1 Grady Hays Unit, 3½ miles southwest of Henderson field, had made a heavy flow of oil and wait-

ing on official completion tests as a Pettet discovery.

The new well flowed 70 bbl. of oil in 16 hours through ¼-in. choke, from perforations at 7,266-70 and 7,276-80 ft. Location is in the H. Cockburn Survey. Henderson field produces from the Pettet and Travis Peak formation.

GULF COAST

New Producer Confirms Rich Port Acres Discovery

Michel T. Halbouty and Pan American Petroleum Corp. have another prolific and rich gas-condensate producer in the new Port Acres field, northwest of Port Arthur, in southeastern Jefferson County. It confirms the lower Hackberry made by Meredith & Co. last August.

The Halbouty-Pan American well, 1 Rosen et al, is rated good for 78,000,000 cu. ft. of gas per day (absolute open-flow gage), recovering 48.8°-gravity condensate in the ratio of 15,350 cu. ft. of gas per barrel of liquid. Shut-in pressure (top) is 7,368 psi. Its pay is perforated at 10,696-10,704 ft. Total depth is 11,460 ft.

Location is northeast of Meredith's discovery, completed from open hole at 10,529-34 ft. following a blow-out. It produced at the rate of 16,478,000 cu. ft. of gas and 838.73 bbl. of 48.8°-gravity condensate per day on absolute open-flow gage.

Meredith's second well, also northeast of the discovery, is nearing the lower Hackberry pay.

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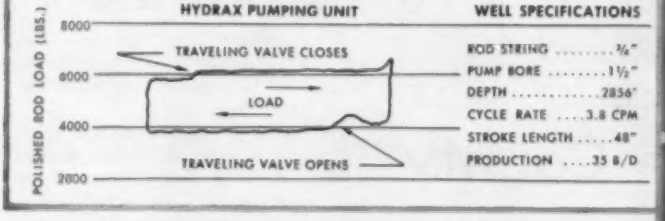

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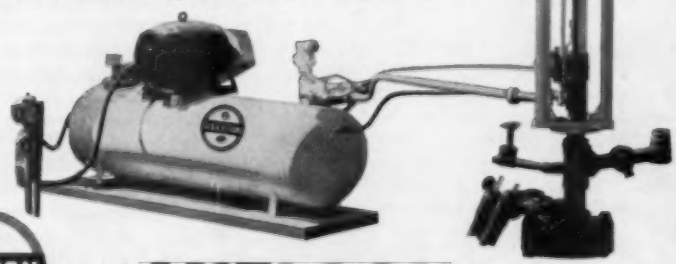

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TEXAS GULF COAST

Hardin County: Sinclair Oil & Gas Co. 1-B Hampton Fee, Alexander Hampton Sur. IP 8,000 M.c.f. daily, absolute open-flow potential, GLR 35.9 M.c.f. per bbl., 59.5°, shut-in pressure 2,680 psi., perforations 8,037-40 ft. (Yegua H-1), and (dual completion) 7,200 M.c.f. daily and 30 BCPD, 59.8°, perforations 8,095-8,102 ft. (Yegua H-3). TD 8,500 ft. (New fie'd.)

Jefferson County: Meredith & Co. et al 1 Weed et al, T&NO Survery, A-206 (1½ miles west of Cheek. IP 204 BOPD, ⅛-in., 37.2°, GOR 772 cu. ft. per bbl., TP 1,350 psi., perforations 8,005-09 ft. TD 8,155 ft. (New reservoir 1 mile southwest of South China field.)

Kelberg County: Northern Pump Co. 1 Allen East et al, Lot 4, Section 41, Kleberg Town & Improvement Co. Subd. (3 miles northeast of Ricardo). IP 18,000 M.c.f. daily, absolute open-flow potentia', GLR 35 M.c.f. per bbl., shut-in tubing pressure 3,285 psi., perforations 8,217-22 ft. TD 8,574 ft. (New reservoir.)

Live Oak County: Kirkwood & Morgan, Inc., and Forney & Worrel 1 Briam, Dennis McGowen Sur., A-29 (2½ miles south of Oakville). IP 2,600 M.c.f. daily, absolute open-flow potential, GLR 84.3 M.c.f. per bbl., 53.4°, shut-in pressure 2,595 psi., perforations 7,204-12 ft. (Wilcox-Luling), and (dual completion) 4,350 M.c.f. dai y, GLR 82.2 M.c.f. per bbl., 55.3°, shut-in pressure 7,005-12½ ft. (Wilcox-Slick). TD 7,767 ft. (New field.)

Matagorda County: F. A. Callery, Inc., 1 Trull Estate, Lot 16, P. W. Grayson Sur., A-43 (5 miles south of Francitas). IP 189 BOPD, ⅛-in., 38.6°, GOR 952 cu. ft. per bbl., TP 1,470 psi., perforations 8,885-92 ft. TD 10,555 ft. (New reservoir 1 mile southeast of Francitas field.)

Newton County: Chesser, Sutton & Davis Dril'ing Co. 2-B Brown "B", J. Henderson Sur. 10, A-180. IP 95,000 M.c.f. daily, open-flow potential, GLR 39 M.c.f. daily, 61.5°, shut-in 2,987 psi., perforations 7,457-62 ft. TD 7,587 ft. (New reservoir in Hartburg area.)

Wharton County: Anderson & Cooke 1 Vitera-Brownson Unit, Lot 8, Block 3, H. P. Mills Sur., A-270 (3½ miles north of Louise). Shut-in gas well, no gage, perforations 5,105-09 ft. TD 5,582 ft. (New field.)

Robinson Oil & Gas Co. 1 Peterson. J. Villanouva Sur., A-315 (6 miles north of Louise). IP 143.42 BOPD, ⅛-in., 32.4°, GOR 388 cu. ft. per bbl., TP 659 psi., perforations 4,935-42 ft. TD 5,126 ft. (New field—2 miles southwest of Trans-Tex field.)

SOUTHWEST TEXAS

Brooks County: Mills Bennett estate 46 Mills Bennett, Juan Jose Guerra El

Tule Grant, A-257. IP 109 BOPD, XX-39 choke, 46.1°, GOR 642 cu. ft. per barrel, TP 300 psi., perfs. 4,366-74 ft. (Frio). TD 5,832 ft. (New reservoir in Mills Bennett field.)

Dimmit County: Sutton Producing Co. 7-A Eard'ey, S. S. Gillett Sur., A-965. IP 65.87 BOPD, ¼-in., 34°, GOR 560 cu. ft. per bb'., TP 160 psi., perforations 2,821-29 ft. (Navarro-Olmos "6"). TD 3,500 ft. (New reservoir in Wintergarden area.)

Pronto Drilling Co. 2-A Vernor, Trinidad Sanchez Sur., A-665 (1½ miles southwest of Carrizo Springs). IP 3,560 M.c.f. daily, abolute open-flow potential, GLR 42.6 M.c.f. per bbl., 28.3°, shut-in pressure 1,180 psi., perforations 2,693-2,702 ft. (Navarro). TD 2,792 ft. (New pay in East Wintergarden field.)

Duval County: Morgan Exploration Co. and Weaver & Sharp 6 Moos, Blk. 12, Parr-Moffett O & G Subd., La Huerta Grant (19 miles southwest of San Diego). IPP 83 BOPD (net), 2 per cent water, 22°, perfs. 3,112-21 ft. (Frio-Ramon sand). TD 3,251 ft. (New field —1 mile south of Mesquite Bonita field.

Duval County: The Texas Co. 2 Herbst, Section 71, SA&MG Sur., A-520 (4 miles east of Freer). IP 71 M.c.f. daily, 5/32-in., TP 120 psi., perforations 2,792-2,800 ft. (Loma Novia). TD 2,870 ft. (New pay in North Herbst field.)

Hidalgo County: S ick Oil Corp. 2 Schuster Unit, T. S. Handy Tract, Agostadero del Gato Grant (8¾ miles southeast of Pharr). Shutin gas well, no gage, perforations 5,237-45 ft. (Frio). TD 8,150 ft. (New pay in Schuster field.)

Bettis & Shepherd, Inc., 1 Ramey, Las Bonitos 37, Llano Grande Grant, A-54 (6½ miles southwest of Weslaco). IP 4,000 m.c.f. daily, absolute open-flow 54.1°, shut-in pressure 3,610 psi., perforations 7,628-36 ft. (Frio). TD 8,000 ft. (New pay in Cano Mexico field.)

Starr County: Consolidated Petroleum, Industries 1 Jose Garza Cantu et a', Share 36, Porcion 204 (1¼ miles southwest of El Sauz) IPP 34.09 BOPD, 50°, perfs. 926-36 ft. (Lower Hockley). TD 1,989 ft. (New field.)

Starr County, Consolidated Petroleum Industry 1 Jose Garza Cantu et al, Porcion 104, Share 36 (1¼miles southwest of El Sauz). IPP 34.09 BOPD, 50°, perforations 926-36 ft. (lower Hockley). TD 1,989 ft. (New field—Alrey.)

Sun Oil Co. 1-C Guerra, Section 301, HE&WT Sur. IP 38.61 BOPD, ⅛-in., 40.8°, GOR 9,270 cu. ft. per bbl., TP 1,275 psi., perforations 4,583-89 ft. (Queen City). TD 5,001 ft. (New field—Pedernal.)

Sun Oil Co. 14-A Chapotal, Porcion 99 (5 miles east of Rio Grande City). IP 89.64 BOPD, 11/64-in., 45.3°, GOR 5,143 cu. ft. per bbl., TP 950 psi., perforations 4.408-13 ft. (Vicksburg. TD 6,730 ft. (New pay in Yturria field.)

Delhi-Taylor Oil Corp. 1-B Cameron et al, Survey 554 (22 miles northeast of Rio Grande City). IP 6,000 M.c.f. daily, absolute open-flow potential, GLR 52.1 M.c.f. daily, 64.5°, shut-in pressure 2,549 psi., perforations 6,771-91 ft. (Vicksburg). TD 7,500 ft. (New pay in Yzaguirre field.)

Shell Oil Co. 5 Andres M. Garza-State, Section 218, Block 6, E. Rangel Sur. IP 56.13 BOPD (net), 9/64-in., 52°, GOR 837 cu. ft. per bbl., TP 750 psi., perforations 6,992-7,006 ft. (Vicksburg), and (dual completion) 270.43 BOPD, $\frac{7}{64}$-in., 53°, GOR 829 cu. ft. per bbl., flowing pressure 500 psi., perforations 5,726-32 ft. (Frio). TD 7,100 ft. (New pays in North Rincon field.)

Edwin A. Branham et al 1 Moreno, Share 108, Jurisdiction of Camargo, Porsion 71 (8 miles northwest of Rio Grande City). IPP 60.49 BOPD, 22.2°, perforations 739½-42 ft. TD 1,547 ft. (New field.)

OHIO

Coshocton County: Natol Corp. 1 E. J. H. Myers, Sec. 14, Clark Township. Clinton 3,321-62 ft. 320,000 cu. ft. TD 3,437 ft.

SOUTH LOUISIANA

Iberville Parish: Aluminum Co. of America 1 Schwing et al, 43-8s-11e. IP 454 BOPD, $\frac{7}{64}$-in., 36°, GOR 676 cu. ft. per barrel, TP 1,900 psi., perfs. 11,224-30 ft. TD 12,021 ft. (New field.)

St. Martin Parish: Texas Pacific Coal & Oil Co. 1 Domengeaux, 57-11s-6e. IP 168 BOPD, ⅛-in., 35.6°, GOR 480 cu. ft. per barrel, TP 925 psi., perfs. 6,492-95 ft. TD 7,475 ft. (New pay in St. Martinville field.)

SOUTHEAST NEW MEXICO

Lea County: The Pure Oil Co. 1 State-Lea "E," SE NE 21-16s-34e. IP 1,440 BOPD, ¼-in., 44°-gravity, GOR 1350, TP 2,750 psi., Seaman limestone

ALL-NEW D&S TRI-DIA BIT!

faster penetration, more rig savings

Designed for safety

Reduced O D wall contact approaches that of Tri-Cone Rock Bit.

Eliminates swabbing, hydraulic action when making trip.

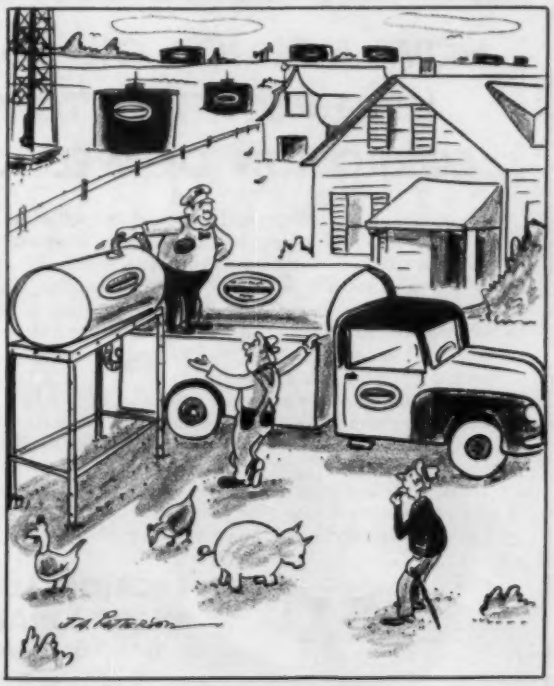
Permits washing out large junk iron pieces, minimizing that hazard.

Readily washes out cavings to bottom.

Reduces mud wall cake sticking hazard.

Largest measurable diameter materially less than diameter of hole it will cut. (Special Bit Breaker required.)

Drilling & Service INC. | DIAMOND DRILLING EQUIPMENT



"What Gramps can't understand is—you get gobs of oil right next door, yet you tote ours clean in from town."

(Pennsylvanian) 11,446-76 ft. TD 11,581 ft. Ground elev. 4,107 ft.

WEST TEXAS

Andrews County: Gulf Oil Corp. 1 State "BM," 29-9-University Lands. Depleted Ellenburger well in Triple N field. Old TD 12,496 ft., PB 12,313 ft., Devonian IP 202 BOPD, 20/64-in., 43°-gravity, GOR 1267, perf. 10,600-10,735 ft. Surrounded by Elenburger production.

Gulf Oil Corp. 3-FI State Consolidated No. 4, Sec. 32, Blk. 9, University Lands. New pay discovery in Triple N field. IP 399 BOPD, ½-in., 46°-gravity, GOR 699, TP 450 psi., Silurian 11,588-11,622 ft.; Ellenburger IP 726 BOPD, 24/64-in., 48°-gravity, GOR 405, TP 400 psi., pay 12,440-12,510 ft. TD 12,510 ft.

Borden County: Tidewater Oil Co. 1 Clayton & Johnson "B," 9-32-T4N-TUP, 10 miles SW Gail. IPP 33 BOPD, 38°-gravity, Spraberry 6,850-6,995 ft. TD 9,867 ft.

Crockett County: Ralph E. Fair 1 Montgomery, 6-J-GC&SF, 14 miles southwest Ozona. IP 240 BOPD, ⅜-in., 35°-gravity, GOR 225, TP 145 psi., Wichita Albany 3,224-71 ft. TD 3,300 ft.

J. E. Jones Drilling Co. 1 Ingham, 1-FFF-TCRR, 10 miles east Sheffield. IP, calculated open flow, 15,000 M.c.f. gas, plus 1 bbl. 60°-gravity distillate per 119,300 cu. ft. of gas, Devonian 7,488-7,548 ft. 8D 7,884 ft., ground elev. 2,643 ft.

Hockley County: Felmont Oil Corp. 1 Phillips, Labor 20, League 28, Hood CSL Sur., 1 mile southeast Levelland. IP 600 BOPD, ½-in., 42°-gravity, GOR 463, TP 175 psi., Strawn 10,120-30 ft. TD 10,862 ft.

Schleicher County: Ashmund & Hilliard 1 Williams "F," 37-1-GH&SA Sur., 16 miles northeast Eldorado, 1¾-in. south Otto-Canyon field. IP 154 BOPD, 14/64-in., 37°-gravity, GOR 1800, TP 950 psi., Strawn 5,162-63 ft. TD 5,398 ft.

Scurry County: W. M. and A. P. Fuller 1 Johnson, 271-2-H&TC, 20 miles northeast Snyder, 2½ miles east-southeast Fuller field. IPP 178.9 BOPD, 38°-gravity, GOR 410, Strawn 7,121-27 ft. TD 7,146 ft.

Upton County: The Texas Co. 1 State "AO," 3-5-University Lands, originally completed as discovery of Hughlene-Ellenburger field. Old TD 11,500 ft., PB 10,928 ft., IP 220 BOPD, 32/64-in., 45°-gravity, GOR 2580, TP 100 psi., Fusselman 10,885-10,905 ft.

CALIFORNIA

Kern County: Union Oil Co. of California, 82-21 Union-Hancock-Cattani, NE NE 21-31s-29e, 1129 BOPD, 33.4°-gravity, ½-in. choke, 3.5 per cent cut, perfs. 7,720-7,585 ft., TD 9,291 ft. (Santa Margarita sand pool discovery 2,000 ft. east of Stenderup pool production in Mountain View field region.)

Reserve Oil & Gas Co., 388-18 Reserve-Butler-Wehr, SE SE 18-11n-19w, 649 BOPD, 34.2°-gravity crude, 18/64-in. choke, 1235 GOR., 2.8 per cent cut, perfs. 416 ft. of 100 M perfs. between 11,585-11,979 ft., TD 12,879 ft. (New Vedder pool discovery north of Tejon-Grapevine field.)

Tidewater Oil Co., 555 Tidewater-Richfield, SW SE 20-31s-23e. 400 BOPD, 31.2° gravity, perfs. 5,059-5,199 ft., TD 6,993 ft. (Stevens sand discovery in Buena Vista Hills.)

Los Angeles County: Union Oil Co. of California, SW NW 15-4n-16w, 158 BOPD, 30.5° gravity, 37 per cent cut, perfs. 10,077-10,539 ft. and 10,624-10,841 ft., TD 11,545 ft. (New field discovery near Saugus.)

Santa Barbara County: Lipkin and Devine, operators, 1 Magenheimer, 8-8n-32w, 20 BOPD., 16° gravity, 13 per cent cut, perfs. 1,242-82 ft., 1,373-1,410 ft., 1,536-76 ft., 1,747-84 ft., and 2,658-2,856 ft., TD 3,900 ft. (Sisquoc sand pool discovery in Howard Canyon region of Gate Ridge field.)

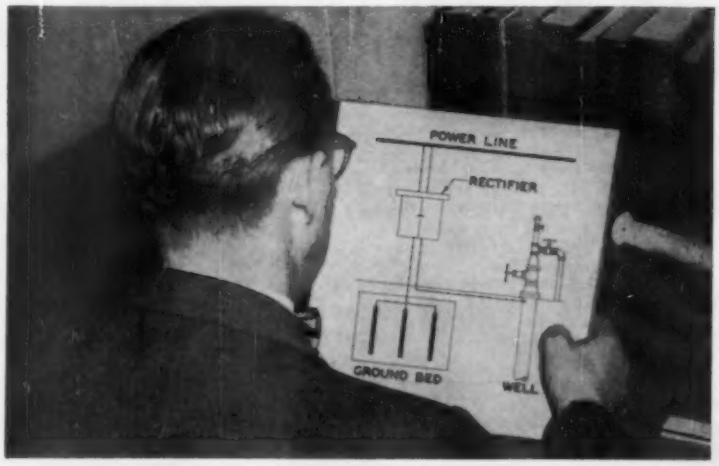
SOUTH LOUISIANA

Iberia Parish: California Co. 3 Williams, Inc., 4, 28-12s-11e. IP 4,350 M.c.f. daily and 18 BOPD, ¼-in., 50.2°, TP 4,225 psi., perforations 11,872-999 ft. TD 13,633 ft. (New field—1½ miles E Big Bayou Pigeon field and 1¾ miles northwest of Bayou Postillon field.)

Plaquemines Parish: Shell Oil Co. 3 Shell-Calco-U.S.A., Township 25s-30e (no section). IP 203 BOPD, 9/64-in., 36.7°, perforations 10,105-35 ft. TD 10,805 ft. (New pay in Burwood area.)

St. Mary Parish: William T. Burton 1 State Lease 2833, Township 16s-13e, in Lake Palourde. IP 61 BOPD and 2,238 M.c.f. daily, 11/64-in., 49°, TP 3,900 psi., perforations 14,744-65 ft. TD 17,772 ft. (New field.)

Vermilion Parish: Texas Gas Exploration Co. 1 Victoria Noel, 5-13s-3e. IP 2,600 M.c.f. daily and 19 BOPD, 3/16-in., 49.9°, TP 3,985 psi., perforations 10,935-40 ft. TD 12,300 ft. (New field—2 miles south of Abbeville field.)



HOW A MAJOR OIL COMPANY USED RECTIFIERS TO STOP CORROSION OF WELL CASING

This major oil company has 33 of its wells in a pool in northwestern Kansas. Past experience indicated that external corrosion of casing would become a major maintenance item.

The wells were surveyed to determine the amount of induced current needed for cathodic protection. Then CSI was awarded a rectifier-installation contract on a competitive bid basis. Ground beds had to be individually designed for each well to meet the two-ohms circuit resistance specified.

CSI engineers furnished and installed 33 rectifiers, graphite anodes, coke breeze and all necessary connections. The job was finished ahead of the promised date, and to exact contract specifications. The cost was approximately $300 per well.

You'll find it pays to call CSI—for expert engineering, installation services and cathodic protection supplies. Estimates or quotations without obligation. Call or write today.

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Aramco Moves Up Cy Hardy

. . . to president's job. The promotion climaxes 31-year career that has carried veteran geologist into oil camps of the Far East and South America.

FRIENDS swear Cy Hardy can talk his way out of nearly any trouble—and usually in the native tongue of the troublemakers.

Hardy sharpened his knack of languages and getting along with people by bouncing around the world on a variety of oil-company jobs ever since 1926.

He will climax his career next month by becoming president of Arabian American Oil Co. By way of preparing for his new tasks, he's learning to read and write Arabic.

This knowledge of languages probably got Hardy out of one of the tightest spots in his life. This was during the early stages of World War II.

Hardy was one of the last Americans to get away from Indonesia. He was in Medan on Sumatra when the Japanese attacked. So he made his way to Batavia, on Java, then to a village on the south coast and finally escaped to Australia aboard a U. S. naval vessel.

While in Batavia, he and other oil men went to a radio station hoping to contact the outside world. Everybody was a suspect at the time. He and his group, obvious foreigners, were not exempt. They were surrounded by a group of Indonesians, and, for a time, it was touch and go. Hardy and his companions escaped with nothing more than a good scare because of two things: his ability to get along with people and to speak Malayan.

Hardy learned to handle the Malay tongue fluently while working as a geologist in the Far East. Later he picked up Dutch while representing his company with the Netherlands government-in-exile.

A nickname . . . Cy Hardy was born in Brooklyn.

Even though his family moved to California when he still was young, he developed into an ardent Brooklyn Dodger fan. As a boy he went to a lot of ball games at Ebbets Field and to him, as to many others, things aren't the same since the Dodgers moved to Los Angeles. Hardy's avid interest in baseball led him to play semipro ball in California and also in Indonesia when he first went there.

His nickname, Cy, came as the result of a strange switch. In the days when his family moved to California, a person who moved from the "sticks" to a city was often called Cy or Rube, two names with a common connotation. His boyhood companions, in a move unexplained to this day, just reversed the common practice on him. He moved from a big city in New York to a small town in California so they dubbed him Cy. The reasoning may not have been sound but the effect was permanent. Today he's far better known as Cy Hardy than as Norman Hardy.

NORMAN HARDY
. . . knack for languages comes in handy.

Veteran in Far East . . . Hardy studied geology at the University of California.

After graduation he went to work with Standard Oil Co. of California in 1926 as a geologist.

He spent much of his early career in Indonesia and, in 1939, became managing director of Netherlands Pacific Petroleum Co., now the Caltex operation in Indonesia.

While there Hardy spent much of his time in the jungles with an all-native crew. It was then that he learned Malayan so fluently . . . he had to.

After his trek out of Java when war came to Indonesia, Hardy wound up in San Francisco. From then until 1944 he was assigned to represent Netherlands Pacific Petroleum in its relations with the exiled Dutch Government. By that time the Japanese held Indonesia and the Germans ruled Holland.

Then in 1944 he went into South America. There he was in charge of operations for Standard Oil Co. of California in Venezuela, Colombia, and Ecuador. The next year he became president of Richmond Exploration Co. in Venezuela.

Hardy came to Aramco in 1951 as executive assistant to F. A. Davies, present board chairman who then was executive vice president. In the same year he also became vice president in charge of field management, a position for which his innate ability to get along with people uniquely fitted him. In May 1956, he was elected executive vice president.

In addition to becoming president, Cy Hardy will also be the chief administrative officer and a director of Aramco. He succeeds R. L. Keyes who reached retirement age. F. A. Davies continues as chairman of the board and chief executive officer.

T. C. Barger, Arabian American Oil Co.'s representative to the Saudi Arab Government, has been elected a vice president of the company and assistant to the president. He will continue to headquarter in Dhahran. Barger came to Aramco in 1937 from Bear Exploration & Radium, Ltd.

Travis M. Slagle, exploration and operations manager for Greenbrier Oil Co., has been elected president of Georesearch, Inc., Dallas. He had been with Greenbrier since 1950.

M. M. Hardy has returned to Magnolia Petroleum Co. as junior petroleum engineer in Electra, Tex. Hardy had been on military leave of absence.

William T. Hudson, formerly district production superintendent in Denver for Cabeen Exploration Corp., has joined Keplinger & Wanenmacher, petroleum consultants, in Tulsa as petroleum engineer.

J. E. Holzman, geologist for Shell Oil Co. in Los Angeles, has been named Durango district geologist for northern Arizona, southeastern Utah, and southwestern Colorado. **E. G. Hoskins,** geologist in Bakersfield, Calif., has been appointed Farmington district geologist for exploration activities in western New Mexico and southern Arizona. Holzman will be head of the company's new Durango, Colo., office. Hoskins will also headquarter temporarily in Durango.

Personals

R. G. Hamilton, Hamilton Well Log Consultants, Tulsa, will travel to Venezuela in January and February to present a series of lectures on well-log interpretation to geologists, engineers, and geophysicists in five cities. During his 6-month tour, Dr. Hamilton will address groups in Anaco, San Tome, Lagunillas, Maracaibo, and Caracas. Four elementary and two advanced schools will be conducted.

J. A. Strand has been appointed petroleum engineering supervisor for British American Oil Co., Ltd. Strand was division reservoir engineer for Canadian Gulf Oil Co. when it was merged with British American. He succeeds **Floyd D. Aaring,** who was recently appointed Calgary zone production manager.

George F. Berry, New Orleans division geophysicist for Continental Oil Co., has been promoted to assistant southern regional geophysicist and transferred to Houston. He succeeds **J. W. Wilson,** who was recently named central regional geophysicist in Oklahoma City. Berry joined Conoco in 1947. He had been division geophysicist in New Orleans since 1954.

Charles A. Nichols, Jr., chief of the overseas section of the Quartermaster General's petroleum division since he retired from Standard Vacuum Oil Co. last year, has been appointed foreign petroleum coordinator in the Office of Oil and Gas. Nichols succeeds **Ralph S. Fowler,** now petroleum consultant to Mobilization Director **Gordon Gray.**

Dr. Vladimir Haensel, director of refining research for Universal Oil Products Co., has been named winner of the American Institute of Chemical Engineers' 1957 professional progress award in chemical engineering. The award is sponsored by Celanese Corp. of America. It will be presented this week at the Chicago meeting of AIChE. Haensel will be cited for "important contributions to the development of catalytic processes for the treatment of petroleum products." Haensel joined UOP in 1937 and was coordinator of the cracking division before being named director of refining research in 1955.

J. S. (Jack) Surfluh, senior engineer, operations, for Standard Oil Co. of California in Taft, Calif., has retired.

Charles H. Mottier, Jr., has been named administrative supervisor in the supply and transportation department of Standard Oil Co. (Ind.). He succeeds **James Zisson.** Mottier has been with the company since 1948.

Fred H. Wilcox, manager of the producing department of Socony Mobil Oil Co., Inc. has been elected a director of the company. **Fred H. Moore,** coordinator of domestic production, moves up to general manager of the producing department. **Henry L. Waszkowski,** assistant to the manager of the producing department, has been named coordinator of domestic production replacing Moore. Waszkowski also becomes a member of the producing committee. Wilcox has been manager of the producing department since 1958 and chairman of the producing committee since

F. H. WILCOX

F. H. MOORE

1956. He was with Magnolia Petroleum Co., Socony's southwestern affiliate, before transferring to New York as coordinator of domestic production for Socony in 1949. He was district geologist for Magnolia in Texas when Pegasus and Scurry fields were developed. Moore began with Magnolia in 1935. He was named executive vice president of Mobil Oil of Canada, Ltd., in 1956. He was appointed coordinator of domestic production just a few months ago. Waszkowski also began with Magnolia. He was assistant superintendent at the affiliate's producing district headquarters at Falfurrias, Tex., before transferring to Socony.

K. L. Dominy, Midwest Oil Corp., has been elected chairman of the Fort Worth section of Society of Petroleum Engineers of AIME. Other officers include **T. E. McGaugh,** Texas Pacific Coal & Oil Co., first vice chairman; **Bryan O. Bishop,** Perforating Guns Atlas Corp., second vice chairman; **Alex Clark, Jr.,** Pan American Petroleum Corp., third vice chairman; and **Clarke Gillespie,** Gulf Oil Corp., fourth vice chairman.

Byron J. Anderson, assistant chief technologist at the Tuscola, Ill., plant of National Petro-Chemicals Corp., has been named manager of the polyethylene plant the company plans to build at Houston. The plant will produce 75 million pounds per year of intermediate density polyethylene resins. It is scheduled for completion in late 1958. Anderson was senior technologist for Imperial Oil, Ltd., before joining National Petro-Chemicals in 1952. The petrochemical company is a subsidiary of U. S. Industrial Chemicals Co. and Panhandle Eastern Pipeline Co.

Ruth Bachrach, staff geologist for Continental Oil Co. in Denver, has been promoted to assistant to the Rocky Mountain regional geologist. A graduate of Knox College and the University of Michigan, she has been with Continental since 1949.

N. W. (Tim) Lassiter, Jr., division superintendent at Charlottesville, Va., for Transcontinental Gas Pipe Line Corp., has been transferred to Corpus Christi, Tex., as superintendent of the compressor division there. **W. H. Buckingham,** senior engineer in the compressor - station department in Houston, has been named superintendent of compressor division in Baton Rouge, La. **J. D. White,** division superintendent at Baton Rouge, transfers to Charlottesville, Va., in the same capacity. **W. W. Adams, Jr.,** superintendent at the Sour Lake, Tex., compressor station, has been named senior engineer in Houston, succeeding Buckingham. **Joe G. Fleniken** will replace Adams at Sour Lake. In other appointments, Transco has named several compressor - station superintendents. **Robert V. Leffers,** repair foreman, has been named superintendent at a station near Appomattox, Va. **Gordon D. Myers,** superintendent at Davidson, N. C., moves to Eunice, La., as superintendent. **J. O. Burdette,** repair foreman, will replace Myers at the Davidson station. **Frank R. Keveryn,** repair foreman at Clanton, Ala., has been appointed superintendent of a gas-conditioning plant soon to be built near Pleasanton, Tex. Superintendents of three new compressor stations now under construction have also been named. They are **Otho H. Lane,** Kings Mountain, N. C.; **A. E. Hamalainen,** Chatham, Va.; and **R. L. McIntyre,** Manassas, Va. They are now overseeing station construction as Transco inspectors.

Personals

John W. Gendron, manager of Tidewater Oil Co.'s oil purchase and exchange department, has been promoted to administrative assistant to the president, a new position. **George W. Goad,** southwestern crude oil department manager for the company in Houston, has been transferred to San Francisco to succeed Gendron. **N. E. Barnett,** assistant manager of the crude-oil department in Houston, moves up to replace Goad there. Gendron joined Tidewater in 1946. He is a director and vice president of Tide Water-Iran, Ltd., and of Iricon Agency, Ltd. He served as president of Iricon last year. Goad joined Tidewater in 1929. During World War II he was assigned to the Petroleum Administration for War and coordinated crude and production shipments through the Big Inch and Little Big Inch pipeline systems.

J. W. GENDRON

G. W. GOAD

L. J. Wanek, geologist for General Petroleum Corp., has been transferred to Durango, Colo., from Sacramento, Calif.

Akiyoshi Tamaki, managing director and chief engineer of Chiyoda Chemical Engineering & Construction Co., Ltd., Tokyo, has been elected president of the company. He succeeds **Shigeo Okubo,** who has been named chairman of the board.

K. E. Boling, production superintendent for Bishop Oil Co. in Abilene, Tex., has been appointed production superintendent of the Pembina district of Canadian Bishop Oil, Ltd. He will headquarter in Drayton Valley, Alberta.

Samuel Brown, Helmerich & Payne, Inc., has been elected 1958 chairman of the Tulsa chapter of American Association of Oilwell Drilling Contractors. He succeeds **R. E. Kirberger,** Service Drilling Co. Kirberger becomes a member of the advisory committee. Other officers are **James Frawley,** Frank Frawley Drilling Co., vice chairman; **Lloyd Worley,** Worley & Harrell, Inc., secretary; and **Lewis Andrews,** Exploration Drilling Co., treasurer.

Glen Rupe, geologist with Womer-Tilton in Abilene, Tex., has been promoted to manager of Womer Oil Co. in Wichita.

William C. Goodson has been promoted by Republic Natural Gas Co. from district reservoir engineer in Corpus Christi, Tex., to senior reservoir engineer in Dallas.

Benjamin H. Weil, chief editor of Esso Research & Engineering Co.'s technical-information division, has been elected 1958 chairman of the American Chemical Society's division of chemical literature.

Richard F. Svoboda has left the Nebraska Geological Survey, where he was petroleum geologist, to open consulting offices in Lincoln, Neb. Svoboda was with Northern Natural Gas Co. before joining the Geological Survey.

J. P. Hamilton has been promoted by Humble Oil & Refining Co. from head of the economics section, technical service division of the Baytown, Tex., refinery, to head of the cost and evaluation division in Houston.

Merle S. Keffer, crude purchasing representative in Houston for Indiana Oil Purchasing Co., has joined Texas City Refining, Inc., as manager of the supply and transportation departments.

Walter J. Porter, Jr., has been appointed assistant head of catalytic research and development at Esso Standard Oil Co.'s Baton Rouge, La., laboratories. Porter succeeds **Dr. Leslie M. Addison,** who has been named head of the company's new personnel section at the Baton Rouge laboratories.

E. G. Albright, senior geophysicist for Cuba California Oil Co., has been elected vice president and resident manager of California Ecuador Petroleum Co., an affiliate. He succeeds **J. P. Fox,** who has joined Richmond Petroleum Co. of Colombia, also an affiliate, as vice president and resident manager. **H. F. Rivers** replaces Albright with Cuba California. The companies are subsidiaries of Standard Oil Co. of California.

W. G. Denning has been named catalytic cracking section head in the technical service division of Humble Oil & Refining Co.'s Baytown, Tex., refinery. **J. W. Alliston, J. M. Andrews,** and **K. K. McMillin** have been named technical specialists at Baytown, and **C. L. Umholtz** has been appointed senior chemical engineer.

Dr. J. N. Payne, Gulf Coast division geologist for Sohio Petroleum Co., has been promoted to chief geologist. He will headquarter in Oklahoma City. A graduate of the University of Arkansas and University of Chicago, Payne was professor of geology at the University of Arkansas when he joined Sohio in 1953. He was appointed Gulf Coast division geologist earlier this year.

Hans L. Gruber has joined Atlantic Refining Co. as research chemist.

J. L. Shackelford, Evansville, Ind., consulting geologist, has joined Kingwood Oil Co., Mount Vernon, Ill.

Rowland C. Hansford has been appointed senior research associate at Union Oil Co.'s Brea, Calif., research center.

Donald J. Saunders, formerly with Shell Oil Co. in Shreveport, La., has joined Arkansas Louisiana Gas Co. as district geologist in Shreveport.

Clyde G. Strachan, staff geologist with Gulf Oil Corp. in Tulsa, has retired. He had been with Gulf 30 years.

Herman Boucher has been named refinery superintendent at Vickers Petroleum Co.'s Potwin, Kans., refinery. Boucher was with Shell Oil Co. before joining Vickers. At Potwin, he succeeds **Quentin Benedict,** who has resigned.

A. Papp, assistant chief geologist in San Francisco for Standard Oil Co. of California, Western Operations, Inc., has transferred to The California Co. as chief geologist in the western exploration region, Denver. **J. H. Kinser** succeeds Papp in San Francisco.

Henry C. Cortes, vice president and a director of Magnolia Petroleum Co. in charge of field research laboratory and coordination of the company's offshore operations, will retire January 1. Cortes will open consulting offices in Dallas after his retirement. **W. W. Clawson,** recently elected vice president and a director of Magnolia, will succeed Cortes as coordinator of offshore operations and supervisor of field research laboratory.

Personals

E. T. Robinson, Jr., has been promoted by Texas Eastern Transmission Corp. from assistant general superintendent to general superintendent of the company's natural-gas division. He will be in direct charge of the division's pipeline and compressor station operations, gas measurement, corrosion control, and dispatching functions. Robinson joined Texas Eastern as an engineer when the firm was formed in 1947. He later served as assistant pipeline superintendent and manager of the company's fifth operating division in Lebanon, Tenn., before being named assistant general superintendent of the natural-gas division in 1954.

George D. Chappell has joined Monsanto Chemical Co.'s Lion Oil Co. division in the research department at El Dorado, Ark. Chappell is a University of Texas graduate. He formerly was technical trainee with Anderson Clayton & Co., Corsicana, Tex.

Kirk Jordan has resigned as district representative at Wichita Falls, Tex., for Independent Petroleum Association of America to become executive secretary of West Central Texas Oil and Gas Association at Abilene. He succeeds **Robert J. Tiffany,** who recently resigned.

Stanley S. Day, geologist, has been transferred to Durango, Colo., from New Orleans by Shell Oil Co. **Burton C. Carlson,** Shell mechanical engineer in Long Beach, Calif., has been transferred to the company's Farmington, N. M., office. **Gerry C. DeWitz** has been promoted from engineer to senior engineer in Shell's Ventura, Calif., division.

L. E. Warren, Gulf Oil Corp.'s assistant district exploration manager in Fort Worth, has been transferred to Western Gulf Oil Co. as division exploration manager. He succeeds **G. W. Ledingham,** who was recently transferred to Gulf Eastern Co., London. **H. B. Leeton,** Houston division production engineer for Gulf, has also transferred to Western Gulf as division production manager. Leeton succeeds **C. B. Hussey,** also transferred to Gulf Eastern.

Dick Brown has been transferred by Gulf Oil Corp. to McLeansboro, Ill., from Centralia, Ill. He is production foreman trainee.

Bernard Mahoney, formerly with Creole Petroleum Corp. in Venezuela, has joined Petroleum Exploration, Inc., Amarillo. He will handle drilling, completion, and production problems for the company.

James D. Craig, Midland, Tex., manager of Empire Drilling Co.'s West Texas division, has been elected a vice president of the company.

D. S. Purnell, a director of Laurel Pipe Line Co. and former division superintendent for Sinclair Pipe Line Co., has been named manager of operations for Laurel. Laurel is owned by Gulf Oil Corp., The Texas Co., and Sinclair.

Wallace K. Reaves, geologist, has been transferred by Continental Oil Co. to Wichita from Jackson, Miss.

James D. Kersey, geologist with Seneca Oil Co., has been transferred to Oklahoma City from Tulsa.

Charles V. Mahaffey, staff exploration geologist for Cities Service Oil Co. in Midland, Tex., has been appointed Roswell, N. M., district geologist. He succeeds **M. F. Kennedy,** who has been given a foreign assignment.

C. C. King, manager of M. W. Kellogg Co.'s chemical-process division, has been named manager of the process-engineering department. **J. L. Patton,** section manager in Kellogg's petroleum - processes division, moves up to succeed King as manager of chemical processes.

DEATHS

Frank E. Richardson, veteran pipeline builder and consultant, died December 3 in Shreveport, La. At the time of his death he was associated with Brown & Root, Inc., and was serving as project engineer for Texas Eastern Transmission Corp.'s Little Big Inch conversion project. Earlier in his career he had served as chief engineer for Great Lakes Pipe Line Co. when that firm was formed to build its products system from Oklahoma to north central states. He resigned to become manager of Pan American Pipe Line Co. at Houston and assistant manager of Pan American Production Co. and Pan American Gas Co. On loan from Pan American during World War II, he participated in design of both "Inch" pipelines and those in the China-Burma-India theater and was a member of the engineering advisory committee for Petroleum Administration for War. He left Pan Am in 1944 to become a consultant.

Alexander Goldsmith, 67, active North Texas oil operator for more than 40 years, died November 27 in Wichita Falls, Tex. Goldsmith was credited with discovering Kempner, West Kempner, Holliday, North Petrolia, and other North Texas fields.

C. Park Hanneman, 51, vice president and a director of Penola Oil Co., died November 22 in Ridgefield, Conn.

Claig H. Perry, 47, on leave of absence as a vice president of Texas Natural Gasoline Corp., died December 2 in Vero Beach, Fla. Perry was with Warren Petroleum Corp. before joining Texas Natural. He spent much of his time with the company as manager of the gas division.

William D. Lane, 59, retired general superintendent of Plymouth Oil Co., died November 30 of injuries suffered in a fall at his ranch 30 miles southeast of Rocksprings, Tex. Lane retired as general superintendent of Plymouth in 1954. He was president of the 1954 Permian Basin Oil Show.

J. A. (Whitey) Buttram, 51, president of Buttram Pipe Line Construction Co., died November 17 in Oklahoma City of cancer. Buttram was pipeline construction foreman and inspector for Continental Oil Co. for 22 years before forming his own company with his son in 1948.

Merl M. Privett, 50, senior engineer with Shell Pipe Line Corp. in Tulsa, died November 28 in Ardmore, Okla., after a heart attack.

W. G. Pickerell, 52, treasurer of Southwestern Oil & Refining Co., died November 25 in Corpus Christi, Tex.

Jack B. Pearson, traffic manager for South Penn Oil Co., died November 27 in Oil City, Pa. He was 34.

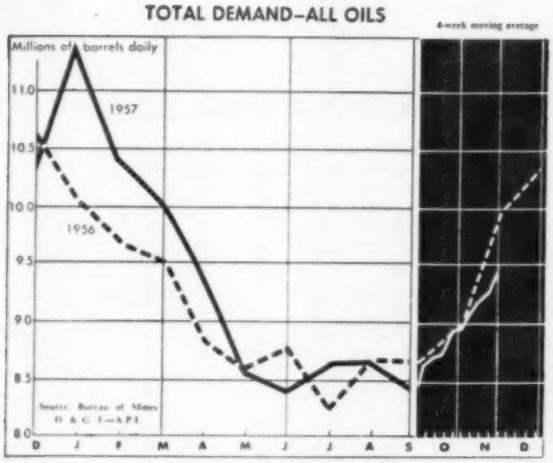
O. K. West, Grosse Pointe, Mich., independent oil operator, died November 25.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,840,880	UP	2,555	DOWN	352,173
Crude stocks	283,139,000	UP	1,053,000	UP	3,297,000
Completions	899	DOWN	116	DOWN	114
Refinery runs	7,807,000	UP	108,000	DOWN	307,000
Gasoline stocks	185,105,000	UP	1,715,000	UP	9,704,000
Kerosine stocks	32,661,000	DOWN	281,000	DOWN	1,934,000
Distillate stocks	167,594,000	DOWN	2,283,000	UP	14,096,000
Residual stocks	58,807,000	DOWN	479,000	UP	14,418,000
Four-product stocks	444,167,000	DOWN	1,328,000	UP	36,284,000
Total imports	1,345,600	DOWN	266,300	DOWN	48,400

TOTAL DEMAND—ALL OILS



Refiners Need to Watch Both Runs And Yields in District 1 and 3

GULF-EAST COAST SUPPLIERS should keep close tabs on supply-demand trends for middle distillates over the next 2 months. Loss of last winter's abnormal export market will call for a change in operating plans this season.

If the weather in the high-demand area of the East Coast averages normal for the heating season, domestic demand for middle distillates in Districts 1 and 3 may be up as much as 10 per cent. The gain would be about 150,000 bbl. daily.

The big change this year will be in exports. Total exports of kerosine and distillate fuels averaged a little more than 230,000 bbl. daily for the six winter months last season. About 180,000 bbl. daily of this total moved either from District 1 or District 3. Normal exports for these districts this winter would be about 45,000 bbl. daily.

Thus, the drop in export shipments of middle distillate this winter may be as much as 135,000 bbl. daily. Since export shipments did not reach a peak until December last year, the influence of these shipments was more pronounced in the first quarter of 1957 than in the last quarter of 1956. The loss of these exports will be felt more in the first quarter of next year than in the last quarter of this year.

The summary of the demand outlook for Districts 1 and 3 shows a probable gain of about 1.0 per cent in total demand for middle distillates if weather is near normal on the East Coast. By quarters, this over-all demand change would be split up into a gain of about 6.5 per cent in the fourth quarter of this year and a decrease of about 3.5 to 4.0 per cent in the first quarter of 1958.

The East Coast heating season through November this year was a little warmer than normal. Boston had 893 degree-days compared with normal of 1,010. New York City was down to 783 degree-days with normal at 827. Philadelphia was up slightly, 901 vs. 889 normal.

Despite above-normal temperatures on the East Coast, demand on refineries in Districts 1 and 3 for middle distillates has been up this fall. For the 7-week period ended November 22, total movement of domestic middle distillates showed a gain of 4.6 per cent over the same weeks last year.

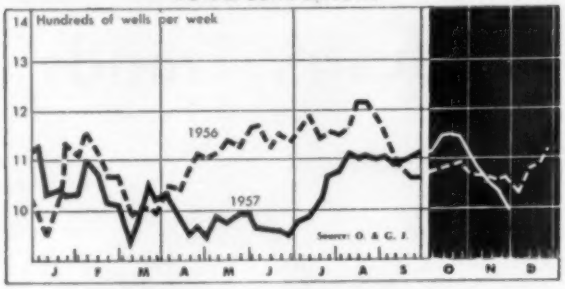
Stocks in these districts showed some relative improvement in the 7-week period. For the corresponding weeks last year, middle-distillate stocks increased 7,500,000 bbl. in Districts 1 and 3. This year, stocks dropped 1,200,000 bbl. The joker in the deal is the fact that the stock total on October 4 was 17,600,000 bbl. above last year. The surplus had been reduced to 8,800,000 bbl. by November 22.

The same type of stock trend has taken place in District 2. Also, the stock position was better at the start of the period. District 2 stocks amounted to 59,300,000 bbl. on October 1, less than a million barrels above the previous year. By November 22, stocks were down to 57,400,000 bbl. or almost 4,000,000 bbl. less than on the same date last year.

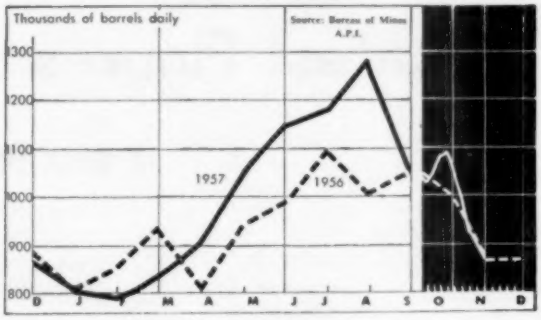
Demand for middle distillate from District 2 refineries for the 7-week period ended November 22 was up better than 2 per cent over the same weeks last year.

Part of the District 2 gain can be credited to weather that has been a little cooler than normal so far this season.

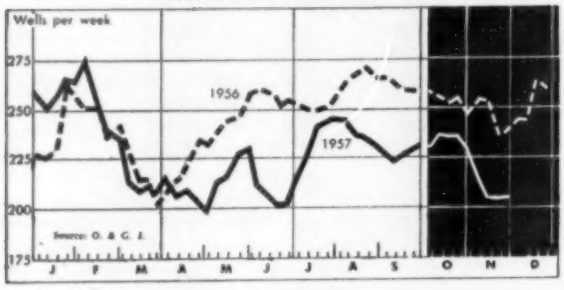
TOTAL COMPLETIONS



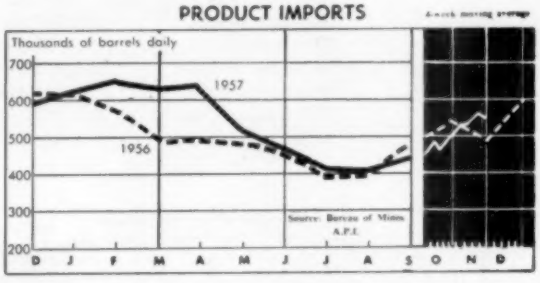
CRUDE IMPORTS



WILDCAT COMPLETIONS



PRODUCT IMPORTS

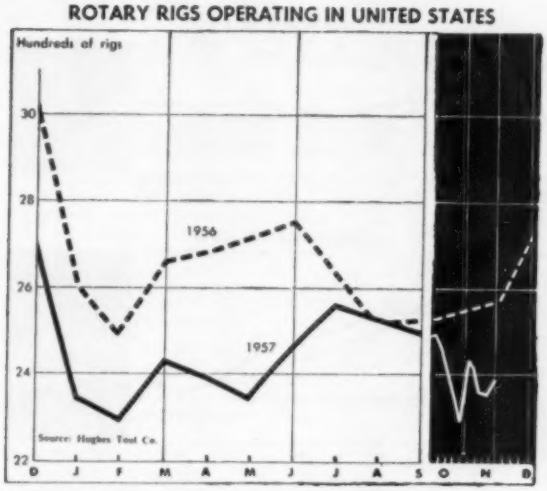


WEEKLY WELL COMPLETIONS . . . WEEK ENDED NOVEMBER 30, 1957

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1957	1956	Total	Crude	Cond.	Gas	Dry	1957	1956
Alabama	0	0	0	0	0	0	0	72	‡103	0	0	0	0	0	25	‡47
Arkansas	11	5	0	0	6	0	42,884	1,016	888	4	0	0	0	4	190	170
California	49	32	0	3	13	1	210,206	2,050	2,060	11	0	0	1	10	484	481
Colorado	12	2	0	2	8	0	68,025	785	1,106	6	1	0	0	5	508	602
Illinois	49	17	0	0	32	0	119,295	2,483	3,551	10	0	0	0	10	587	708
Indiana	8	4	0	0	4	0	14,418	636	663	1	0	0	0	1	121	132
Kansas	77	32	0	3	40	2	258,200	3,872	4,544	20	1	0	0	19	754	988
Kentucky	32	4	0	5	23	0	40,224	1,402	1,769	9	1	0	0	8	290	403
Louisiana	59	31	4	1	23	0	446,514	3,558	3,488	10	3	0	0	7	624	707
North	26	16	0	1	9	0	83,597	1,336	1,539	4	2	0	0	2	186	241
South	26	13	4	0	9	0	293,054	1,600	1,565	4	1	0	0	3	357	396
Offshore	7	2	0	0	5	0	69,863	622	384	2	0	0	0	2	81	70
Michigan	6	3	0	0	3	0	16,936	404	399	0	0	0	0	0	141	151
Mississippi	13	2	3	0	8	0	110,309	363	403	7	0	0	0	7	186	200
Montana	17	3	0	0	14	0	84,570	397	430	11	0	0	0	11	159	165
Nebraska	15	6	0	0	9	0	84,734	820	863	8	1	0	0	7	447	426
New Mexico	33	22	0	6	5	0	188,673	1,970	1,766	2	1	0	0	1	246	256
Northwest	14	5	0	6	3	0	50,954	838	784	1	0	0	0	1	95	93
Southeast	19	17	0	0	2	0	137,719	1,132	982	1	1	0	0	0	151	163
New York	9	4	0	0	0	5	9,250	428	.....	0	0	0	0	0	9	.....
North Dakota	10	8	0	0	2	0	56,865	273	245	3	1	0	0	2	120	74
Ohio	30	17	0	6	7	0	83,694	1,044	997	0	0	0	0	0	16	12
Oklahoma	92	46	1	3	38	4	302,700	5,765	7,545	9	2	0	0	7	689	798
Pennsylvania	0	0	0	0	0	0	0	571	†1,042	0	0	0	0	0	41	†31
Texas	350	185	16	12	135	2	1,531,796	19,775	19,966	75	7	0	1	67	4,652	5,156
District 1	30	6	0	0	24	0	94,945	1,141	*2,854	13	1	0	0	12	397	*1,001
District 2	15	1	2	4	8	0	102,995	715	*2,430	4	0	0	0	4	242	*796
District 3	28	11	6	2	9	0	186,472	1,524	.....	6	1	0	1	4	419	.....
District 4	19	3	3	2	11	0	104,880	1,275	.....	4	1	0	0	3	403	.....
East	20	9	2	0	9	0	107,806	1,246	1,053	8	0	0	0	8	351	394
District 7-B	41	20	0	0	21	0	141,665	2,698	.....	14	1	0	0	13	909	.....
West	108	86	0	2	18	2	539,114	5,611	5,289	14	2	0	0	12	794	837
District 9	67	35	1	1	30	0	162,549	4,271	*7,120	11	1	0	0	10	1,033	*2,011
District 10	22	14	2	1	5	0	91,370	1,294	1,220	1	0	0	0	1	104	117
Utah	4	1	0	1	2	0	22,771	231	130	3	0	0	1	2	117	81
West Virginia	8	0	0	8	0	0	20,455	635	642	0	0	0	0	0	30	24
Wyoming	15	2	0	1	12	0	89,772	798	829	8	0	0	1	7	278	253
Miscellaneous	0	0	0	0	0	0	0	124	71	0	0	0	0	0	106	64
Total U. S.	**899**	426	24	51	384	14	3,802,291	49,472	53,500	**197**	18	0	4	175	10,820	11,929
Total prev. week	1,015	544	20	57	378	16	4,297,794	.....	.....	222	36	0	4	182	.....	.....
Cum. 1957	49,472	25,459	568	3,558	18,886	1,001	204,896,145	.....	.....	10,820	1,090	98	361	9,271	.....	.....
Western Canada	56	38	0	3	15	0	268,816	2,765	2,991	14	1	0	3	10	787	.....

*Districts: 2 & 3, 1 & 4, 9 & 7-B, formerly combined. †Incl. New York. ‡Incl. Florida and Georgia.

ROTARY RIGS OPERATING IN UNITED STATES



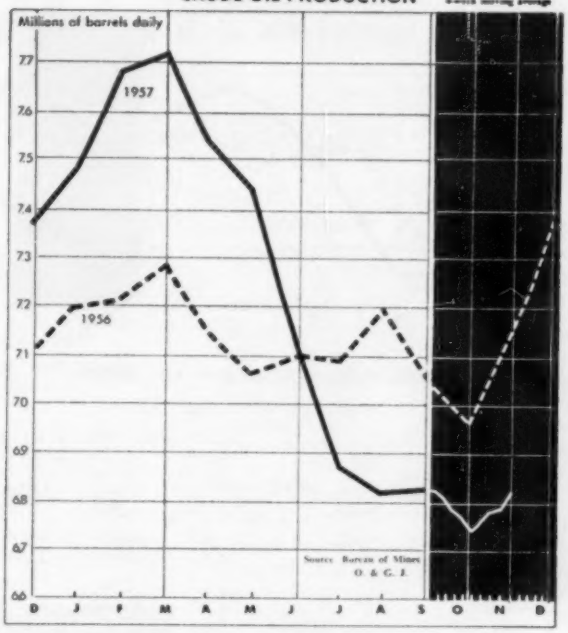
ACTIVE ROTARY RIGS*

Area—	12-2-57	11-25-57	11-18-57	12-3-56
Alabama	6	7	7	10
Arkansas	28	28	28	18
Arizona	1	1	1	...
California	98	99	89	114
Colorado	44	47	47	60
Florida	2	2	2	2
Georgia	...	...	...	...
Idaho	...	...	...	...
Illinois	54	37	47	53
Indiana	8	8	7	10
Iowa	2	2	2	1
Kansas	152	146	159	180
Kentucky	9	6	8	12
Louisiana	370	389	381	478
North	41	52	53	69
South	250	257	254	314
Offshore	79	80	74	95
Maryland	1	...	1	...
Michigan	11	10	9	15
Mississippi	37	44	47	29
Missouri	...	...	...	1
Montana	34	36	34	37
Nebraska	25	25	24	26
Nevada	...	...	...	2
New Mexico	158	149	155	127
New York	1	1	1	...
North Dakota	46	42	39	29
Ohio	1	1	1	...
Oklahoma	265	245	238	281
Oregon	...	...	...	...
Pennsylvania	9	9	12	8
South Dakota	2	2	3	2
Texas	903	888	877	1,087
Gulf Coast	174	173	173	255
Offshore	5	5	5	9
West	352	347	354	386
North	327	317	299	359
East	45	46	46	78
Tennessee	...	...	...	...
Utah	56	55	58	26
Washington	1	1	1	1
West Virginia	4	4	4	2
Wyoming	65	67	75	63
Virginia	...	...	...	...
Total United States	2,393	2,351	2,357	2,674
Western Canada	175	166	184	231
Eastern Canada	2	2	2	...
Grand Total	2,570	2,519	2,543	2,905

*Hughes Tool Co.

CRUDE-OIL PRODUCTION

4-week moving average

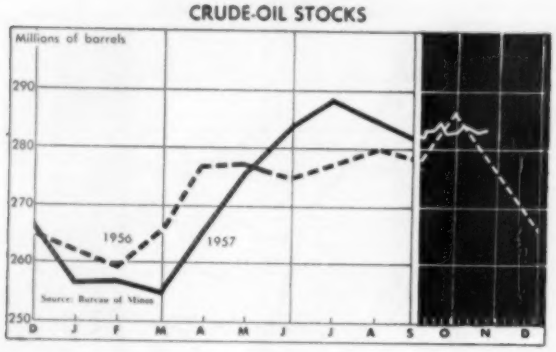


DAILY AVERAGE PRODUCTION FOR WEEK

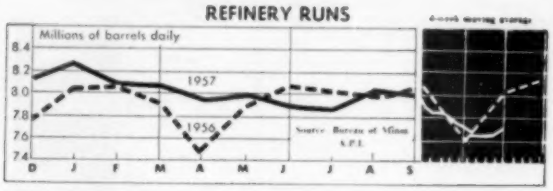
	November 30, 1957			Nov. 23
	Crude oil	Lease condensate	Total	total
Alabama	17,200	.....	17,200	17,125
Arkansas	82,600	200	82,800	82,750
California	925,200	.....	925,200	926,300
Colorado	143,650	.....	143,650	147,000
Eastern	53,400	.....	53,400	53,100
Florida	1,250	.....	1,250	1,250
Illinois	232,000	.....	232,000	236,600
Indiana	33,000	.....	33,000	32,200
Kansas	†326,500	.....	†326,500	†334,500
Kentucky	49,200	.....	49,200	42,900
Louisiana	734,700	82,400	817,100	816,800
North	110,700	2,400	113,100	112,800
South	624,000	80,000	704,000	704,000
Michigan	26,300	.....	26,300	27,800
Mississippi	93,700	4,400	98,100	98,100
Montana	74,500	.....	74,500	74,000
Nebraska	55,050	.....	55,050	54,600
Nevada	100	.....	100	150
New Mexico	248,850	5,500	254,350	254,350
North Dakota	33,000	.....	33,000	33,200
Oklahoma	†584,700	.....	†584,700	†571,200
Texas	2,665,000	56,400	2,721,400	2,721,400
Dist. 1	50,000	525	50,525	50,525
Dist. 2	120,000	9,050	129,050	129,050
Dist. 3	380,000	27,000	407,000	407,000
Dist. 4	198,000	6,350	204,350	204,350
Dist. 5	32,000	450	32,450	32,450
Dist. 6	110,000	6,400	116,400	116,400
East Texas field	162,000	.....	162,000	162,000
Dist. 7-B	143,000	100	143,100	143,100
Dist. 7-C	150,000	3,850	153,850	153,850
Dist. 8	1,010,000	1,500	1,011,500	1,011,500
Dist. 9	207,000	600	207,600	207,600
Dist. 10	103,000	575	103,575	103,575
Utah	11,580	.....	11,580	12,600
Wyoming	300,300	.....	300,300	300,250
Others	‡200	.....	‡200	‡150
Total U. S.	6,691,980	148,900	**6,840,880**	6,838,325
Change from prev. week, up			**2,555**	
Canada	†422,500	.....	†422,500	§†454,260
Total U. S. production—Jan. 1-Nov. 30				§2,400,378,980 bbl.
Same period last year (crude plus cond.)				*2,389,072,306 bbl.

*Includes 41,321,680 bbl. condensate. ‡Week ended previous Monday. †South Dakota. §Revised.

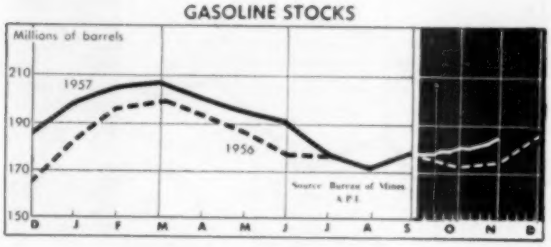
CRUDE-OIL STOCKS



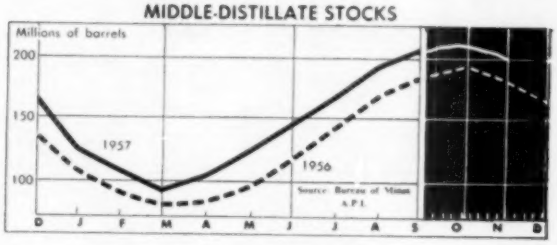
REFINERY RUNS



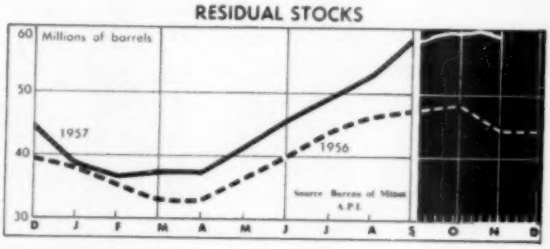
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	11-23-57	11-16-57	11-24-56
Pennsylvania Grade	3,196	3,125	2,436
Other Appalachian	1,795	1,866	2,384
Illinois, Indiana, and Michigan	10,470	10,841	11,760
Nebraska and North Dakota	2,726	2,787	2,347
Kansas	10,884	10,600	10,756
Oklahoma	20,596	20,986	23,830
Arkansas	2,685	2,564	2,985
Louisiana	20,791	20,652	18,312
North	3,342	3,388	2,540
South	17,449	17,264	15,772
Mississippi, Ala., and Fla.	2,956	2,560	3,197
New Mexico	9,571	9,479	8,363
Texas	125,765	125,350	127,299
East Texas	9,341	9,723	9,009
West Texas	55,547	55,113	61,339
Texas Gulf	26,218	25,911	24,253
Other Texas	34,659	34,603	32,698
Wyoming	14,037	13,638	16,864
Other Rocky Mountain	7,150	7,344	6,555
California	33,508	32,319	29,016
Foreign	†17,009	17,975	13,728
Total	283,139	282,086	279,842

*Bureau of Mines. †Includes 6,427,000 bbl. in California.

A.P.I. REFINERY REPORT—NOVEMBER 29, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production— Gaso.*	Kero.	Dist.	Resid.	Stocks‡— Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1956— Daily avg. runs	Daily average production— Gaso.*	Kero.	Dist.	Resid.
East Coast	1,118	416.7	39.4	324.0	172.4	44,652	13,929	66,538	12,980	1,141	446.6	36.0	310.5	205.0
Appalachian:														
District 1	101	45.4	4.6	23.9	9.0	4,967	622	3,509	633	105	40.9	6.3	27.0	6.3
District 2	109	53.4	9.8	17.4	19.3	2,692	443	1,454	271	101	55.5	6.1	18.7	13.0
Ind., Ill., Ky.	1,464	763.9	79.6	335.6	181.0	31,541	6,857	23,524	6,081	1,429	742.3	78.0	295.3	193.1
Minn., Wis., Dak.	82	34.4	3.1	19.1	8.4	6,652	1,446	7,922	366	100	49.9	8.1	25.5	9.0
Okla., Kans., Mo.	689	397.7	8.9	180.3	31.1	14,857	1,612	13,006	1,229	694	379.0	17.1	176.1	33.8
Inland Texas	250	190.0	8.6	33.4	21.3	6,982	456	2,204	2,163	267	186.1	8.3	54.6	19.5
Texas Gulf Coast	1,782	866.3	120.3	449.4	197.9	24,017	3,445	18,510	7,221	1,960	896.7	135.8	490.8	252.1
La. Gulf Coast	581	339.0	38.1	154.0	29.4	11,210	2,227	8,774	1,367	667	368.9	68.5	165.9	56.1
N. La. and Ark.	99	46.0	9.4	18.1	6.0	4,488	922	2,071	225	103	42.2	9.9	22.2	6.9
Rocky Mountain:														
New Mexico	29	15.7	—	5.6	3.9	447	13	94	70	27	13.4	0.6	5.2	3.5
Other Rocky Mt.	279	135.0	5.6	70.4	35.3	5,766	344	2,878	937	268	136.5	4.4	62.4	37.2
West Coast	1,224	582.9	—	162.2	331.0	26,924	345	17,110	25,264	1,170	501.3	4.5	187.3	346.8
Nov. 29, 1957	7,807	3,886.4	327.4	1,793.4	1,046.0	185,105	32,661	167,594	58,807	8,032	3,859.3	383.6	1,841.5	1,182.3
Nov. 22, 1957	7,699	3,816.4	294.4	1,734.0	1,015.3	183,390	32,942	169,877	59,286	.....	.....	.....	.....	.....
Nov. 30, 1956	8,114	3,863.3	340.9	1,968.4	1,223.9	175,401	34,595	153,498	44,389	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.50-11.75
Premium (98 octane)	14.25-14.50
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.75-11.00
Regular (92 octane)	11.00-11.25
Premium (97 octane)	12.50-12.75
Premium (98 octane)	12.75-13.00
California (rack) (Los Angeles):	
Regular (88 octane)	12.2
Premium (96 octane)	14.8
Premium (98 octane)	15.0
Caribbean area (cargoes):	
Regular (87 octane)	10.625
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
★Grade 26-70	3.5-4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-10.00
Diesel oil (58 d.i. and above)	9.125-9.75
Distillate No. 1	9.125-9.75
Distillate No. 2	8.50-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	8.75-9.50
Distillate No. 2	8.75-9.50
New York Harbor (barges):	
Kerosine 41-43	10.75
Distillate No. 2	10.25
Diesel fuel, 48-52 d.i.	10.55
Caribbean area (cargoes):	
Distillate No. 2	9.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.60-1.80
Gulf Coast (cargoes):	
Bunker C fuel	$2.50-2.75
New York Harbor (barges):	
Bunker C fuel	$2.95
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour) (§)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.81
16-16.9	2.74	....	....	....	1.86
17-17.9	2.78	....	....	....	1.91
18-18.9	2.82	....	....	....	1.96
19-19.9	2.85	....	....	....	2.01
20-20.9	2.89	$2.75	....	$2.62	2.06
21-21.9	2.93	2.77	....	2.64	2.11
22-22.9	2.97	2.79	....	2.66	2.16
23-23.9	3.01	2.81	$3.44	2.68	2.21
24-24.9	3.05	2.83	3.46	2.70	2.26
25-25.9	3.09	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour. §Most buyers are posting Wyoming sour in two schedules, 15°-26.9° and 27°-40°.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.65
Middle District	4.47
Southwest Pennsylvania	4.18
West Virginia	4.00
Buckeye Grade	4.00
Zanesville Grade	3.04
Illinois Basin	3.15
Canada:	
Leduc-Woodbend	2.74
Redwater (Alta.)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 36.0°-36.9°, Fao	2.00
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.59
Iraq, 36.0°-36.9°, Tripoli, Banias	2.59
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★Gulf-U.S.N.H., clean (USMC—27.5%)	$2.07
★Carib.-U.K., clean (Scale—36.5%) (20s. 8d.)	2.89
★P.G.-U.K., clean (USMC—52.5%)	5.18
★P.G.-Neth., dirty (Scale—57.5%) (24s. 0d.)	3.22

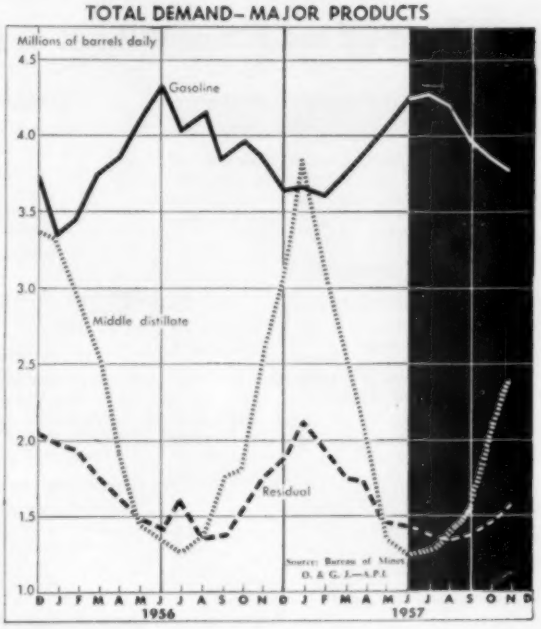
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

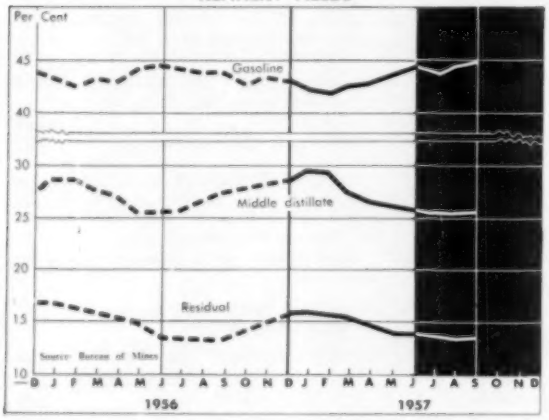
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
November 1957*	3,765	3,825	186,000
October 1957*	3,870	3,915	181,410
September 1957	3,896	4,062	180,688
December 1956	3,641	3,986	187,271
November 1956	3,862	3,859	174,808
KEROSINE			
November 1957*	355	300	32,500
October 1957*	325	265	34,260
September 1957	220	276	36,382
December 1956	477	379	31,420
November 1956	434	384	34,329
DISTILLATE			
November 1957*	2,040	1,740	167,000
October 1957*	1,620	1,740	174,770
September 1957	1,334	1,772	173,269
December 1956	2,566	1,981	133,981
November 1956	2,105	1,841	151,517
RESIDUAL			
November 1957*	1,575	1,045	58,600
October 1957*	1,475	1,050	59,340
September 1957	1,252	1,100	58,727
December 1956	1,870	1,288	44,491
November 1956	1,769	1,182	44,590

*Preliminary. †Thousands of barrels.

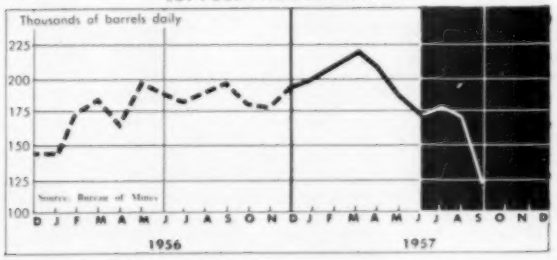
TOTAL DEMAND–MAJOR PRODUCTS



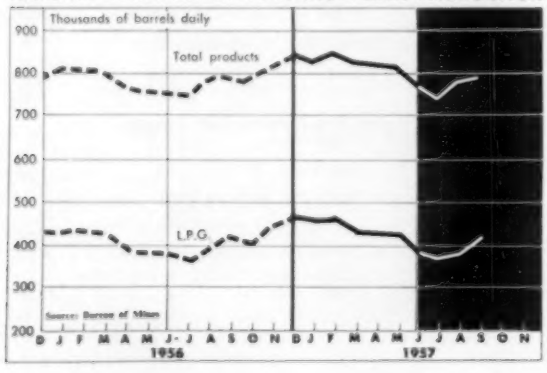
REFINERY YIELDS



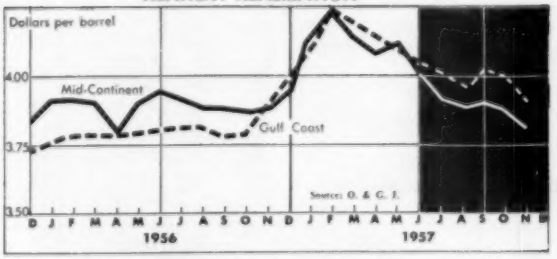
JET-FUEL PRODUCTION



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



REFINERY REALIZATION



REFINERY REALIZATION

	Nov.* 1957	Oct.* 1957	Sept. 1957	Nov. 1956
Mid-Continent	$3.82	$3.88	$3.88	$3.88
Gulf Coast	3.92	4.00	4.02	3.89

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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1—5' x 96' tower, 40 tray, 135# WP.
1—2' x 45' tower 24 trays.

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3 Pacific ITB, 400 gpm.—2,000' hd. 735 gpm—3,100' hd.
5 Pacific SVTB, 621 gpm—600' hd. 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 gpm—408' Hd.
BJ hot oil pump, 3 x 9, 14 st, 324 gpm, 4600' hd.

HEAT EXCHANGERS

4—Kellogg Adm. Flte. Hd. 2200, 1300 Sq. Ft., 315#
4—Kellogg Steel Flte. Hed. 800, 650, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome
5—Steel 1,000, 900, 800, 600, 500 Sq. Ft.
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2—4-6% Chrome 1,000, 500 Sq. Ft.

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1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 LBS. 385 CFM 160 lbs.

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6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 28.
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ECONOMIST: 34 years, college degree, presently employed. Experienced in all phases of property evaluation, income tax, cost analysis, market research, and general business management. Box K-455, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF GEOLOGIST with sizable Independent. Age 32, legal background, experienced in production, exploration, economics, reservoir and subsurface research. Can furnish management sound exploratory program. Desire position with security—salary nominal. Box K-448, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST, Masters degree 1954, three years research, sedimentation, marine geology; desire West Coast position in research, oil, or mining geology. Box K-452, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, age 30, MS, 5 years experience with large major in the Central Rocky Mountain and Colorado Plateau area in numerous phases of exploration geology. Desires employment with small major or well established independent. Box K-439, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 30, Master's, 5½ years major, 1 stratigraphic, 4½ subsurface in Texas, some surface Rocky Mountain area, will relocate. Box K-459, The Oil and Gas Journal, Tulsa, Oklahoma.

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450,000 BARRELS of recoverable oil by water-flooding for 10 cents per barrel. Core analysis. Terms—oil payment and cash. Box K-438, The Oil and Gas Journal, Tulsa, Oklahoma.

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WANTED: Oil properties, 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

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LIMITED TIME available to provide special engineering reports on your oil and/or gas leases, proposed or drilling wells. Write, John R. Shoffner, Reg. Prof. Engrs. Kittanning, Pa.

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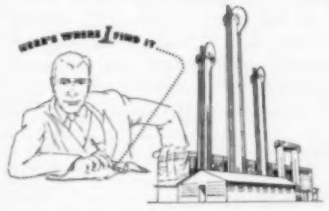

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Actually he's a lot of men. Men that have jobs to fill or want a new position; equipment to buy or sell; production, acreage, leases, or real estate to sell or buy; or a business opportunity. He may be looking for your services, maps, or field records.

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P. O. Box 1260 — Tulsa, Okla.

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WE WANT producing royalties, producing oil & gas properties, also farmouts gas acreage. Ben H. Williams — Clarendon, Texas.

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FOR QUICK ACTION, working interest for sale at $450 per ⅛ to drill shallow well on 30 acre lease with four drill locations staked by geophysical survey, and adjoining big producers right in heart of the new booming East Coweta pool. Write L. Snavely, Geologist, Box 315, Coweta, Okla.

WILL GIVE big interest for drilling 4700 ft. well on 717 acre United States Oil and Gas Lease Serial Number Wyoming 03793. Offset production rated 8000 barrels per acre reserves. NO PRORATION. For map write Owner, Box 44, Sheridan, Wyoming.

OIL AND GAS LEASE—Largest undeveloped area in proven territory, Northern W. Virginia. Excellent possibilities in five sands. Need partner or sell outright. Anna A. Brost, Ft. Washington, Pennsylvania.

OIL LEASES, Royalties, shallow drilling deals. Call or write, R. E. Clement, Box 65, Norman, Oklahoma.

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PRIVATE PARTY desires good primary drilling acreage, with or without production at present, and with pay zone less than two thousand feet. Must be in Southern Oklahoma, North Texas, or New Mexico. Submit full details of terms, geology, lease status, etc., in first letter. Box K-442, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING CAPITAL WANTED: We will send geologist's report on structure southwest Arkansas. We have drilled to lower Cretaceous and geologist recommends deepening to Pennsylvania sands with possible prolific gas. Burns Oil Co., Box 1098, Shawnee, Okla.

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BOX K-417,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

EQUIPMENT MEN . . . in the news

J. O. Hankins Represents BJ Tools in Venezuela . .

J. O. HANKINS

and will assist in the promotion of sales and service of BJ oil-field products in Venezuela.

According to Garth Nicolson, vice president and general manager of Byron Jackson Tools, Inc., Hankins will work out of the Maracaibo office of Oilfield Sales & Service, S.A., Venezuelan distributor for BJ oil tools. Hankins was formerly BJ district manager of the Kansas-Oklahoma area. His new activities will be under the direction of Earl Rees, export manager.

The new move will provide improved service and stocks for BJ customers and expedite sales of oil tools in the drilling areas near Anaco and Maracaibo.

J&L Supply Division Names Leimbrook, Smith . .

to sales posts. John L. Leimbrook has been appointed salesman at the Farmington, N. M., store. Paul C. Smith, formerly salesman at Pawhuska, Okla., has been transferred to Woodward, Okla., according to W. L. Wolfe, vice president, sales.

Leimbrook joined J&L in January 1957 as a salesman at Alice, Tex. Previously he had been a sales trainee in the Pittsburgh office of Jones & Laughlin Steel Corp. Smith was first employed as a storeman at Bartlesville, Okla., in 1953. He was appointed salesman at Pawhuska in 1955.

Schutte & Koerting Co. Forms New Division . .

to manufacture and market the company's precision instruments for measuring fluid rate of flow and other related products.

The instrument division will be housed in a completely new 25,000-sq.-ft. plant now nearing completion in Cornwells Heights, Bucks County, Pa. According to U. W. Fischer, company president, this division will provide increased customer service, including application and service engineering, and will provide expanded facilities for the manufacture of Rotameters for measuring, indicating, recording, and controlling the rate of flow of all types of fluids, flow indicators, and other related instruments.

Indair, Inc., Signs Helicopter Option . .

with Vertol Aircraft Corp. for three Vertol 44 utility helicopters. According to William H. Gunther, Jr., general manager of Indair, the initial effort will be to provide helicopters on charter for the petroleum industry. Later the firm expects to expand into broader fields of executive, personnel and cargo transportation.

The Vertol 44 carries 19 passengers or more than 2 tons of cargo.

Indair's headquarters office is in New York City.

Datamatic Opens West Coast Regional Office . .

in Los Angeles for the manufacture of large-scale electronic data-processing systems. Samuel J. Weigand, recently named West Coast sales manager, will head the new office, according to John E. Johnson, vice president of marketing.

Weigand, formerly assistant manager of the sales department, joined Datamatic in 1955 after working as production coordinator and systems and procedures analyst at the parent firm, Minneapolis-Honeywell Regulator Co.

Bradford Laboratories Moves to New Building . .

on the northern outskirts of Evansville, Ind. The firm specializes in water treatment for the secondary recovery of oil and provides water-consulting services for injection wells and down-hole treatment of producing wells. The completely equipped laboratory is one of three operated by Bradford Laboratories, a subsidiary of Hagan Chemicals & Controls, Inc., Pittsburgh.

Other branch laboratories are located in Huntington, W. Va., and Bradford, Pa. A fourth branch will be opened in Abilene, Tex., on January 1 to service the water-flood fields in West Central Texas.

Bradford's Evansville branch has been servicing secondary recovery operations in a three-state area since 1950. According to James Holben, manager of the Evansville branch, Bradford will continue to design and supervise construction of complete oil-field water-treatment plants as well as provide technical consulting services.

National Aluminate Corp. Adds to Office, Lab . .

with completion of a $1,500,000 facility. Total office, laboratory, manufacturing and warehouse area for the chemical firm's main operation now exceeds 365,000 sq. ft. The Nalco organization also includes eight other manufacturing sites in the United States, Canada and Europe.

Other phases in recent Nalco expansion included the acquisition of adjacent Lamson-Sessions property and buildings, and the construction of a chemical processing building, increasing Nalco's capacity for liquid chemical production almost tenfold.

Continental-Emsco Fills District Mgr., D+B Posts

R. D. CASSEL

Robert D. Cassel has been named district manager, headquartering in the company's Los Angeles office. Formerly a division production machinery specialist, Cassel joined the firm in 1948. He has also been manager of pumping unit sales and machinery salesman for Continental-Emsco's manufacturing plant in Los Angeles.

Appointed to the position of D+B specialist are: N. P. Burkett, to be stationed in the Laurel, Miss., store; Robert L. Hicks, to be stationed in Snyder, Tex.; Leroy Polk, in McCamey, Tex.; and Jesse E. Dennis, in Winnsboro, Tex.

Westinghouse Appoints John L. Cross . .

industrial sales manager for the Atlantic apparatus sales region in Philadelphia, Pa.

Cross entered Westinghouse Electric Corp.'s student training course in 1933 and later held various sales posts in the New York sales office and the transformer division in Sharon, Pa. In 1941 he became manager of power equipment sales at the Sharon works, and in 1957 until his present assignment he served as assistant sales manager of apparatus products at Westinghouse headquarters in Pittsburgh.

Austin-Western Division Promotes R. H. Diller . .

to the position of advertising manager, succeeding Howard F. Barrows, who recently retired. According to Henry P. Lockhart, assistant general manager of Austin-Western, division of Baldwin-Lima-Hamilton Corp., Diller joined the division in 1951 as assistant advertising and sales promotional director.

McNamar Boiler & Tank Co. Fills Sales Posts . .

by appointing Fred C. Catron as manager of the special sales division and naming William J. Williams as sales representative for McNamar's new sales offices opened in Houston to serve the Gulf Coast area.

According to James Jackson, president, Catron has been with the firm 6 years and was previously with National Tank Co. 2 years. He has been connected with the fabricating industry for some time.

Before joining McNamar, Williams was district manager, carillon sales, for Stromberg-Carlson in Rochester, N. Y., and has had many years of sales experience.

McNamar manufactures pressure vessels of all kinds and for a number of years has been a large supplier to the petroleum and chemical industries.

Edward Valves, Inc., Names Robert A. Seethaler . .

to the newly created post of sales-engineering liaison executive in East Chicago. According to W. F. Crawford, president, Seethaler formerly was Pittsburgh district sales manager. He joined Edward as a sales engineer and assistant district sales manager in 1951 and has been a district sales manager since 1954.

Prior to joining Edward, Seethaler was a layout engineer for American Bridge Co.

Houston Firm Appointed by Mid-States Chemical . .

as Gulf Coast representative. Leland Hamner Co. will cover the Southwest and Gulf Coast areas of Texas and southern Louisiana. Leland Hamner has representatives in Corpus Christi, Tex., Lafayette and Houma, La., as well as in Houston.

As a result of this appointment, drillers and producers in the Gulf Coast area will be able to secure products of Mid-States Chemical Co., Inc., from supply stores soon.

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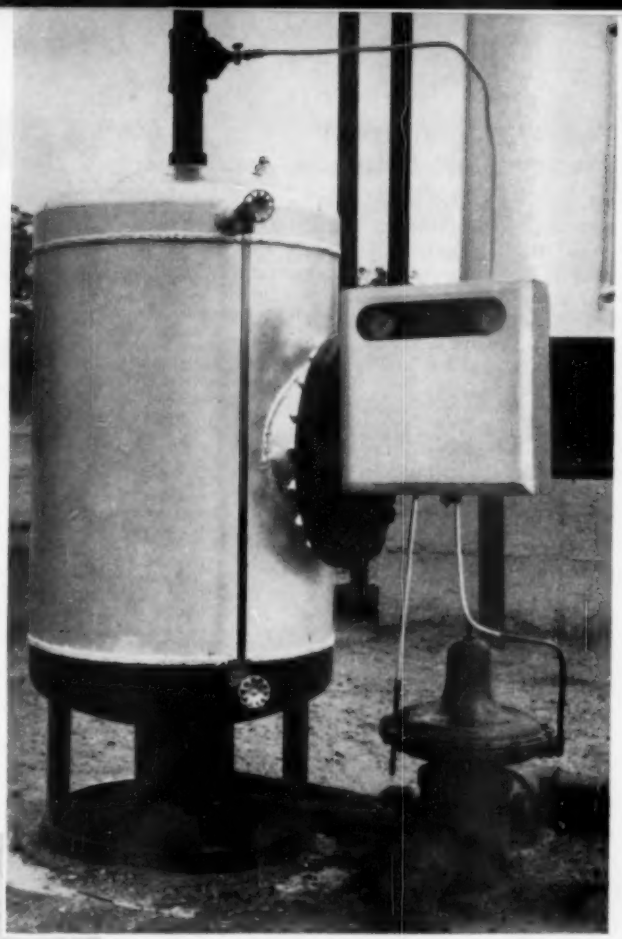
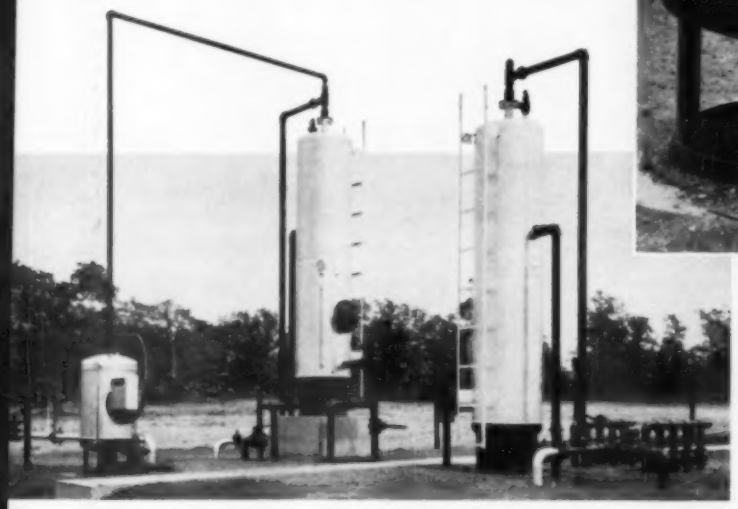
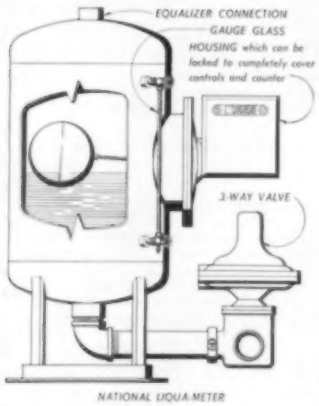
NATIONAL liqua-meter*



1 bbl. capacity Liqua-Meter on multi-well lease in Southern Oklahoma.



1 bbl. capacity Liqua-Meter and two National 2½' x 10' 2IF Separators — one on the left used as test separator.



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TULSA, OKLAHOMA

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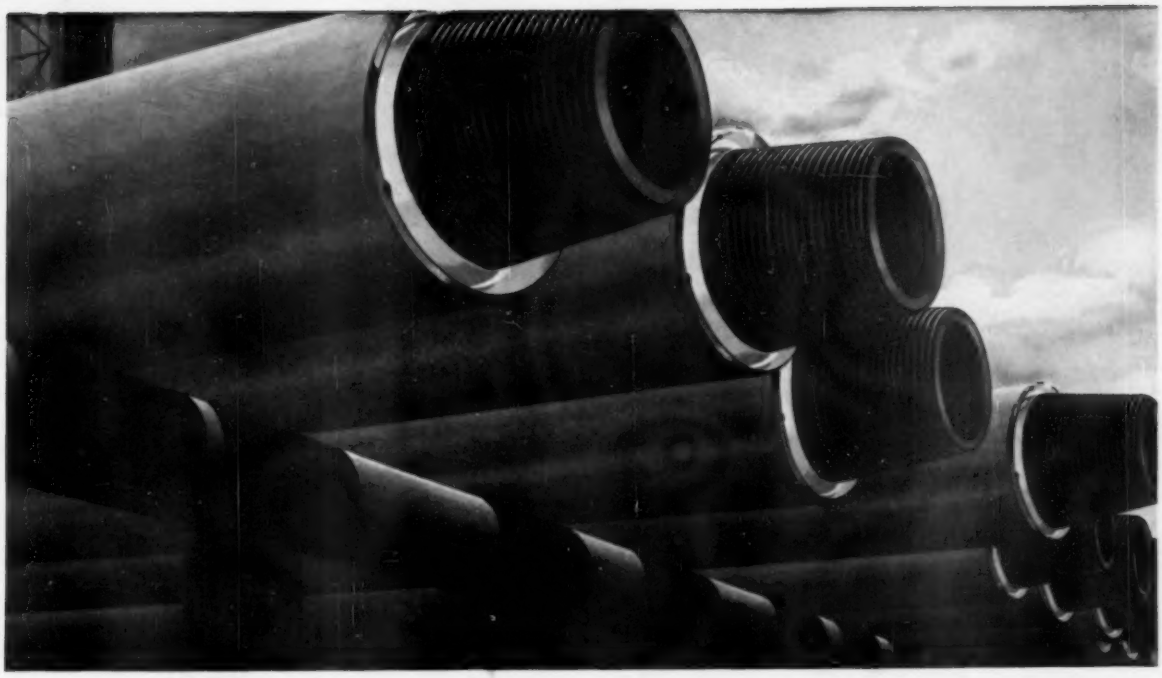

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